

Instruction Manual

ETX Astro Telescope ■ ETX Spotting Scope



Meade Instruments Corporation

WARNING! Never use the Meade ETX Astro Telescope or ETX Spotting Scope to look at the Sun! Observing the Sun, even for the shortest fraction of a second, will cause irreversible damage to your eye as well as physical damage to the telescope itself.

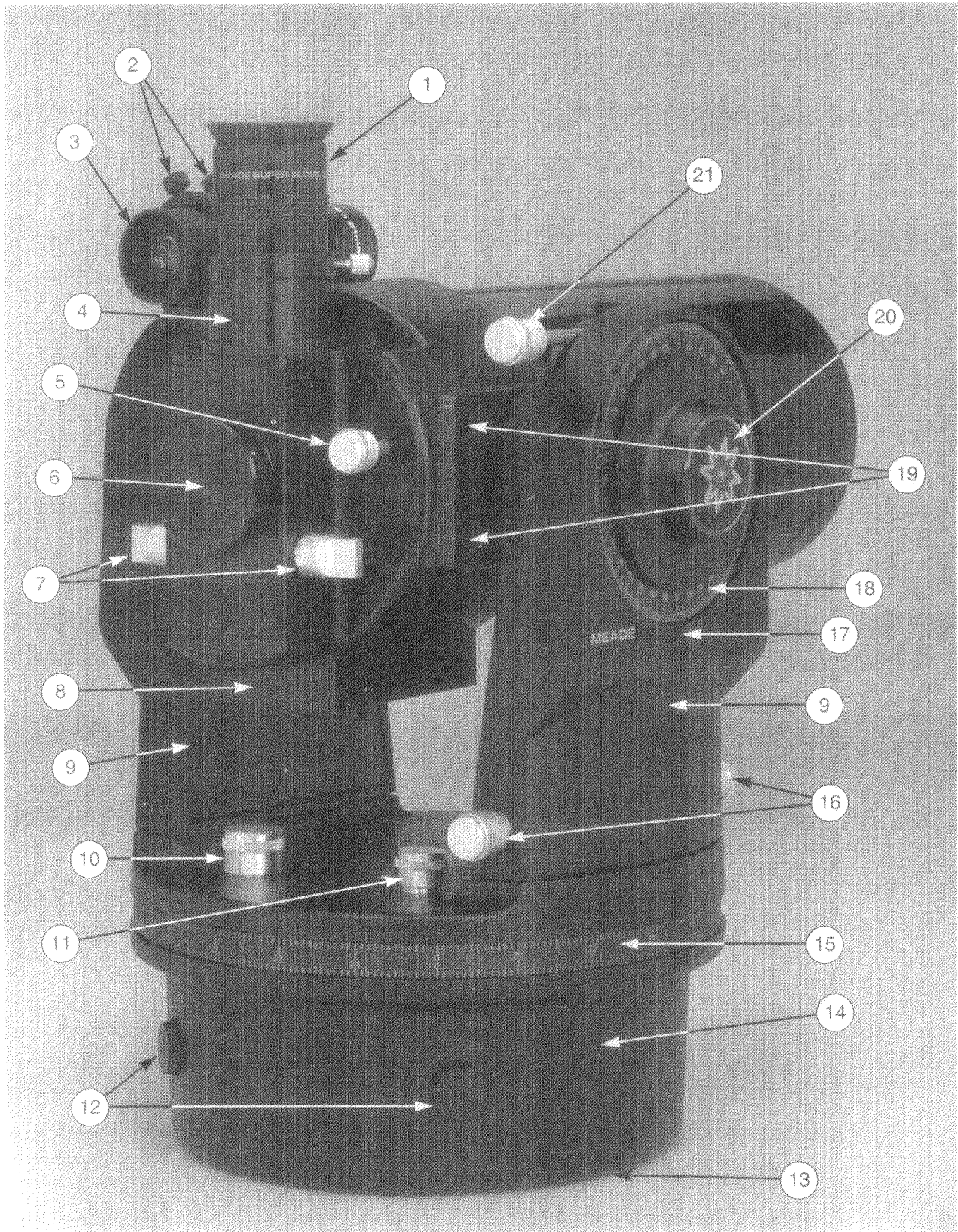


Fig. 1: The ETX Astro Telescope

Captions for Fig. 1

- 1. Eyepiece
- 2. Viewfinder Alignment Screws
- 3. Viewfinder
- 4. 90° Eyepiece-Holder
- 5. Focuser Knob
- 6. Photo Port
- 7. Flip-Mirror Control Knobs
- 8. 1/4-20 Photo-Tripod Adapter Block
- 9. Fork Mount
- 10. R.A. Slow-Motion Control
- 11. R.A. Lock
- 12. Attachment Holes for Fixed Tripod Legs
- 13. Bottom Surface of Drive Base
- 14. Drive Base
- 15. R.A. (Right Ascension) Setting Circle
- 16. Dec Slow-Motion Control
- 17. Declination pointer
- 18. Dec (Declination) Setting Circle
- 19. Screws for attaching Optical Tube to Fork Mount
- 20. Declination Cover Plate
- 21. Declination Lock

Contents

The ETX Astro Telescope

- Introduction 4
- Getting Started 4
 - Parts Listing 4
 - Assembly Instructions 4
- Telescope Use 5
 - Quick Tips 5
 - Telescope Controls 5
 - Magnification 5
 - First Observations 6
 - The Viewfinder 6
- Observing Objects 7
 - Terrestrial Observing 7
 - Astronomical Observing 7
 - Celestial Coordinates: Declination and Right Ascension 7
 - Polar Alignment 8
 - Alternate Polar Alignment Procedure 9
 - Locating Astronomical Objects 10
 - Motor Drive 10
 - Setting Circles 10
 - Photography through the ETX 11
 - Objects In Space 11
 - Moon 11
 - Planets 12
 - Deep Sky Objects ... Beyond the Solar System 12
 - Constellations 12
 - Helpful Charts 12
 - Latitudes of the World 12
 - Star Locator 13
- Optional Accessories 13
- Telescope Maintenance and Servicing 15
 - General Maintenance 15
 - Proper Storage and Transport of the Telescope 15
 - Inspecting the Optics 15
 - Troubleshooting 16
 - Meade Customer Service 16
 - Specifications 16

The ETX Spotting Scope

- Introduction 17
- Getting Started 18
 - Parts Listing 18
 - Assembly Instructions 18
- Telescope Use 18
 - Quick Tips 18
 - Telescope Controls 18
 - Magnification 18
- Observing Objects 19
 - The Viewfinder 19
 - Terrestrial Observing 20
 - Photography through the ETX Spotting Scope 20
- Optional Accessories 20
- Telescope Maintenance and Servicing 21
 - General Maintenance 21
 - Proper Storage and Transport of the Telescope 21
 - Inspecting the Optics 21
 - Troubleshooting 22
 - Meade Customer Service 22
 - Specifications 22
- Meade Limited Warranty 23

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Note: The Meade ETX Telescope is available in two formats: the ETX Astro Telescope, which includes an astronomical fork mounting system (as shown on page 2) and the ETX Spotting Scope, which is intended for use with a standard photo tripod. Instructions for use of the ETX Astro Telescope begin immediately below; instructions for use of the ETX Spotting Scope begin on page 17.

INTRODUCTION

THE ETX ASTRO TELESCOPE

The Meade ETX is an extremely versatile, high-resolution telescope designed for *everyone*. Unlike larger or more specialized telescopes that might appeal only to the advanced amateur astronomer, the ETX is an easy-to-operate telescope with fingertip controls, an internal motor drive for automatic tracking of astronomical objects, and one of the finest optical systems ever manufactured for a commercial telescope.

As a *first telescope*, the ETX reveals nature in an ever-expanding level of detail: observe the feather structure of a bird from 50 yards or study the rings of the planet Saturn from a distance of 800 million miles. The Meade ETX is an instrument fully capable of growing with the user's interests. For many, the ETX is all the telescope ever required.

As a *second telescope* for the amateur astronomer who may already own a larger instrument, the ETX represents extreme portability without sacrificing the most demanding requirements for optical quality and field performance.

The result of more than five years in development by an elite team of Meade optical designers and engineers, the Meade ETX is, without question, one of the most revolutionary telescopes to be developed in the past 25 years. We urge the ETX user to read this manual thoroughly, in order that you might avail yourself of all the designed-in features at your disposal with this amazing instrument.

GETTING STARTED

Parts Listing

In keeping with the ETX philosophy of elegant simplicity, the ETX is virtually completely assembled at the Meade factory; getting the telescope ready for first observations requires only a few minutes. When first opening the packing box, note carefully the following parts included with the ETX Astro Telescope:

- The ETX Astro Telescope with fork mount system.
- 8 x 21mm Viewfinder, packed in a separate, small box.
- Super Plössl (SP) 26mm eyepiece, packed in plastic storage container.
- Table Tripod legs (3 pcs), packed in a plastic bag.
- Hex-wrench set with 3 (English-format) wrenches, packed with the manual.

The 8 x 21mm Viewfinder is packed separately from the main telescope in shipment to avoid the possibility of the viewfinder slipping in its bracket and scratching the viewfinder tube.

Assembly Instructions

For assembly, have at your access a Phillips-head screwdriver and three AA size batteries. Basic assembly of the telescope requires only three steps:

1. Slide the viewfinder into its bracket (5), Fig. 2, with the rubber-eyecup-end of the viewfinder fitting first through the front end of the bracket. It may be necessary to slightly unthread the six alignment screws (4) and (6), Fig. 2, to fit the viewfinder into the bracket. With the viewfinder inside

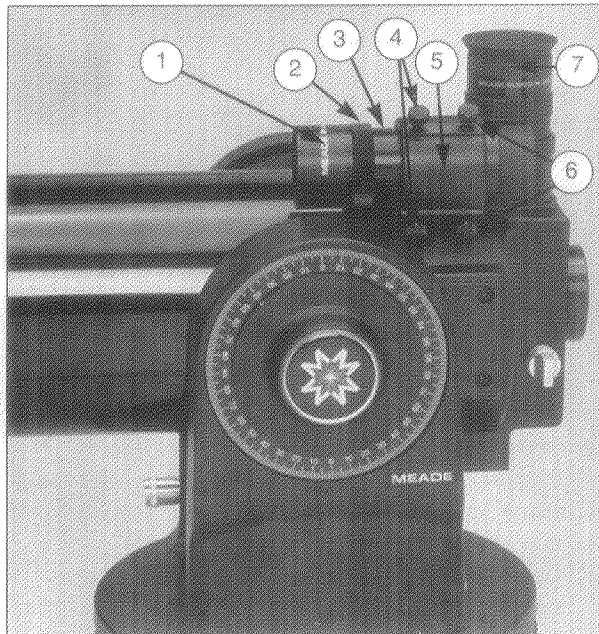


Fig. 2: The Viewfinder. (1) Lens cell; (2) Knurled lock-ring; (3) Viewfinder; (4) Front alignment screws; (5) Viewfinder bracket; (6) Rear alignment screws.; (7) Eyepiece.

the bracket, tighten (to a firm feel only) the six alignment screws down against the viewfinder tube. Alignment of the viewfinder will be discussed in a later section of this manual.

2. Remove the SP 26mm eyepiece (1), Fig. 1, from its plastic storage container and place it in the telescope's eyepiece-holder (4), Fig. 1, tightening the eyepiece-holder's thumbscrew to a firm feel only.
3. With the telescope lying on your lap or on the floor, use a Phillips-head screwdriver to remove the three screws (1), Fig. 3, that attach the metal base plate (5), Fig. 3, to the bottom of the drive base (6), Fig. 3. Thread the center tripod leg, the leg with the latitude scale, in to the central hole (3), Fig. 3 of the metal base plate. Then, carefully pull the base plate from the drive base. Remove the tripod leg. Insert three AA-size batteries in the battery clips located

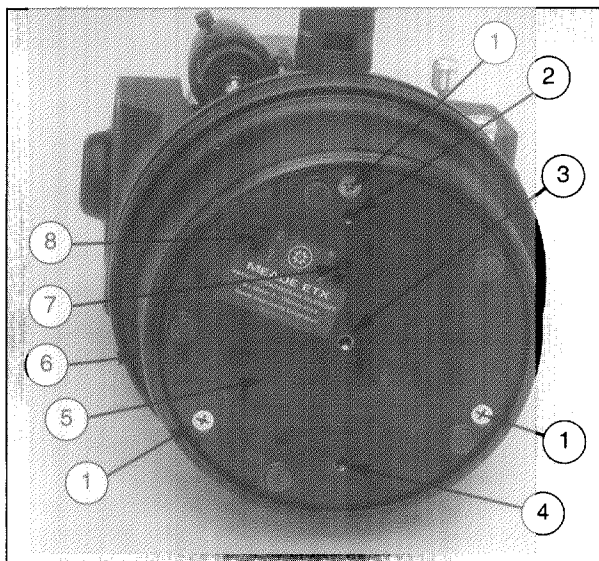


Fig. 3: Bottom surface of the drive base. (1) Attachment screws; (2) Upper hole; (3) Center hole; (4) Lower hole; (5) Base plate; (6) Drive base; (7) North-South switch; (8) On-Off switch.

inside the drive base; *be careful to avoid touching the thin wires leading from the battery mounting board to the motor.* See Fig. 4. Orient the batteries as shown on the battery mounting board. Then re-attach the metal base plate to the bottom of the drive base.

Basic assembly of the ETX is now complete.

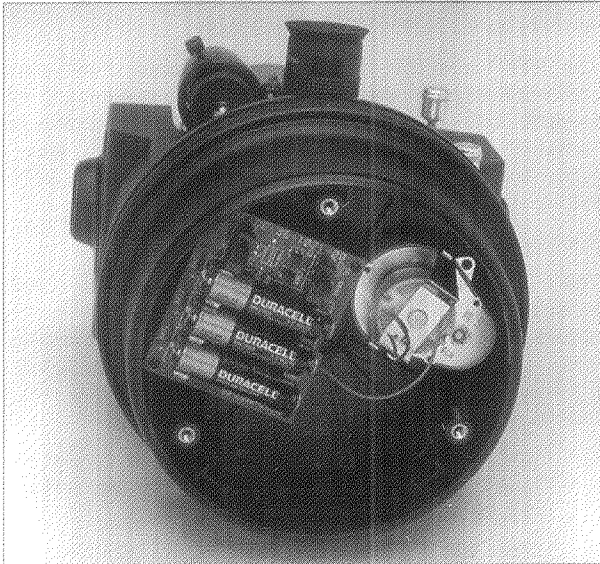


Fig. 4: Showing three AA-size batteries installed inside the drive base.

TELESCOPE USE

Quick Tips

1. **Viewfinder Alignment with Main Telescope:** When first attached to the telescope, the viewfinder and main optical tube are not aligned. Therefore, it is not possible to locate objects in the main telescope using the viewfinder. Procedures for aligning the viewfinder and main telescope are discussed on page 6 of this manual.
2. **Declination and R.A. Controls:** With the ETX sitting on a table, as in Fig. 1, the Declination controls are used to move the telescope vertically (up and down). The Right Ascension controls are used to move the telescope horizontally (side to side).
3. **Move Knobs Slowly:** When making adjustments in R.A., Dec. or focusing, turn the controls slowly. Moving the controls too quickly may result in losing the object or passing the focus point.
4. **Moving the ETX Astro Telescope:** The ETX optical tube is not designed to rotate a full 360° through its fork arms. The viewfinder bracket contacts one of the fork arms at a point just past the 90° position of the optical tube in the fork arms. Do not attempt to force the telescope tube past this point or damage to the viewfinder bracket will result.

Telescope Controls

An important array of controls facilitates operation of the ETX telescope. *Be sure to acquaint yourself with all of these controls before attempting observations through the telescope.*

R.A. Lock (11) Fig. 1: With the ETX sitting on a table as shown in Fig. 1, this control locks the telescope from moving horizontally. Turning the R.A. Lock *counterclockwise* unlocks the telescope horizontally, enabling the telescope to be freely moved by hand in a horizontal direction. Turning the R.A. Lock

clockwise locks the telescope in horizontal position. (The definition of "R.A.", or "Right Ascension", is explained on page 8.)

R.A. Slow-Motion Control (10) Fig. 1: With the R.A. Lock in the *unlocked* position, the R.A. Slow-Motion Control may be used for manual slow-motions of the telescope in a horizontal direction. The R.A. Slow-Motion Control should never be turned when the R.A. Lock is in the locked position; damage to the internal gears may otherwise result. The R.A. Lock must be engaged for the motor drive to track on an object.

Dec Lock (21) Fig. 1: With the ETX sitting on a table as shown in Fig. 1, this control locks the telescope from moving vertically. (The definition of "Dec," or "Declination," is explained on page 8.) Turning the Dec Lock *clockwise (to a firm feel only)* locks the telescope in the vertical position. Turning the Dec Lock about one full turn *counterclockwise* permits manual motion of the telescope in the vertical position.

Dec Slow-Motion Control (16) Fig. 1: With the Dec Lock in the *locked* position, the Dec Slow-Motion Control may be used for fine motions of the telescope in a vertical direction. The Dec Slow-Motion Control has a fixed travel length. At some point after turning the Dec Slow-Motion Control continuously in the same direction, the control will become difficult to turn. Do not attempt to turn the Dec Slow-Motion Control past this point or damage to the internal mechanism will result. Instead, back-off the Dec Slow-Motion Control by turning the control about 50 turns in the opposite direction. Unlock the Dec Lock and move the telescope manually to center the object; then resume use of the Dec Slow-Motion Control.

Focus Knob (5) Fig. 1: Turning this knob causes a finely-controlled internal motion of the telescope's primary mirror to achieve precise focus of the telescopic image. The ETX can be focused on objects from a distance of about 11.5 ft (3.5m) to infinity. Rotate the focus knob *clockwise* to focus on distant objects; rotate the focus knob *counterclockwise* to focus on near objects.

Flip-Mirror Control (7) Fig. 1: The ETX includes an internal optically flat mirror. With the Flip-Mirror Control in the "up" position, as shown in Fig. 1, light is diverted, at a 90° angle, to the eyepiece. Alternately, with the Flip-Mirror Control in its "down" position, light proceeds straight through the telescope and out the Photo Port (6) Fig. 1, for through-the-telescope photography, using the optional #64 T-Adapter, page 13, or for observing with the optional #932 45° Erecting Prism, page 14.

Magnification

The magnification, or power, at which a telescope is operating is determined by two factors: the *focal length of the telescope* and the *focal length of the eyepiece employed*.

Telescope Focal Length: Generally speaking, telescope focal length is the distance that light travels inside the telescope before reaching a focus. In the mirror-lens design of the ETX, however, this focal length is, in effect, compressed by the telescope's secondary mirror, so that a long effective telescope focal length is housed in the short ETX optical tube. The ETX's focal length is 1250mm, or about 49". If the ETX were a classical refracting-type of telescope, its optical tube would thus be more than four feet long instead of the ETX's compact 11" tube length.

Eyepiece Focal Length: The eyepiece focal length is the distance light travels inside the eyepiece before reaching focus. Focal length is usually printed on the side of the eyepiece. The Meade ETX is supplied with one eyepiece as standard equipment, a Super Plössl (SP) 26mm eyepiece. Thus, the focal length of the provided eyepiece is 26mm. "Super Plössl" refers to the optical design of the eyepiece, a design specifically intended for high-performance telescopes and one which yields a wide, comfortable field of view with extremely high image resolution.

Technical note to the advanced amateur astronomer: The SP 26mm eyepiece supplied with Meade ETX telescopes is a special low-profile version of the standard Meade SP 26mm eyepiece and is about 1/4" (6mm) shorter than the standard eyepiece. This low-profile SP 26mm is designed to harmonize with the ultracompact scale of the ETX telescope and utilizes the exact same optics as the standard SP 26mm eyepiece. The SP 26mm low-profile eyepiece is not parfocal, however, with other eyepieces in the SP series; i.e., the eyepiece requires re-focusing when it is interchanged with other SP eyepieces.

Calculating Magnification: On a given telescope, such as the ETX, different eyepiece focal lengths are used to achieve different magnifications, from low to high. The standard-equipment SP 26mm eyepiece, as stated above, yields 48X. Optional eyepieces (see page 13) and the #126 2x Barlow Lens are available for powers from 31X to over 300X.

To calculate the magnification obtained with a given eyepiece, use this formula:

$$\text{Power} = \frac{\text{Telescope Focal Length}}{\text{Eyepiece Focal Length}}$$

Example: The power obtained with the ETX with the SP 26mm eyepiece is:

$$\text{Power} = \frac{1250\text{mm}}{26\text{mm}} = 48\text{X}$$

The most common mistake of the beginning observer is to "overpower" the telescope by using high magnifications which the telescope's aperture and typical atmospheric conditions can not reasonably support. Keep in mind that a smaller, but bright and well-resolved, image is far superior to a larger, but dim and poorly resolved, one. Powers above about 300X should be employed with the ETX only under the steadiest atmospheric conditions.

Most observers will want to have 3 or 4 eyepieces and the #126 2x Barlow Lens to achieve the full range of reasonable magnifications possible with the ETX. See page 13 for further details.

First Observations

Unthread the metal dust cap from the front lens, and the ETX Astro Telescope may now be used for land observing. (The dust cap should be replaced after each observing session.) Keep in mind, however, that the viewfinder has not been aligned, and it will be necessary to locate objects simply by sighting along the main telescope tube. With the SP 26mm eyepiece inserted in to the telescope's eyepiece-holder, the telescope is operating at 48-power (written "48X").

Objects viewed through the eyepiece will be correctly oriented up-and-down in the telescope but will be reversed left-for-right. Image orientation is discussed in more detail on page 7. As explained below, the Flip-Mirror Control must be in the "up" position in order to observe an image through the telescope.

After familiarizing yourself with the telescope's controls, make your first observations of a simple land object—a telephone pole or building, perhaps, several hundred yards in the distance. Sight along the side of the telescope's main tube to locate the object. Practice focusing on the object and centering it in the field of view using the R.A. Slow-Motion Control and Dec Slow-Motion Control. Use the Flip-Mirror Control, noting that this Control must be in the "up" position in order to use the eyepiece as shown in Fig. 1.

The Viewfinder

The ETX, as with almost all astronomical telescopes, presents a fairly narrow field of view to the observer. As a result it is sometimes difficult to locate and center objects in the telescope's field of view. The viewfinder, by contrast, is a low-power, wide-field sighting scope with crosshairs that enables the easy centering of objects in the main telescope's field. Standard equipment with the ETX is a viewfinder of 8-power and 21mm aperture, called an "8 x 21mm viewfinder."

The ETX viewfinder, unlike most telescope viewfinders, presents a correctly oriented image, both up-and-down and left-for-right. This orientation particularly facilitates the location of terrestrial objects. The 8 x 21mm viewfinder is also a tremendous aid in locating faint astronomical objects before their observation in the main telescope.

Focusing the Viewfinder

The ETX viewfinder has been factory pre-focused to objects located at infinity. Individual eye variations, however, may require that the viewfinder be re-focused for your eye. Looking through the viewfinder, point the telescope at a distant object; if the viewfinder image is not sufficiently in focus for your eye, it may be re-focused as follows:

1. Remove the viewfinder from its mounting bracket (5), Fig. 2, by slightly unthreading the six alignment screws until the viewfinder can slip out easily.
2. Loosen the knurled lock-ring (2), Fig. 2, located near the viewfinder's objective (front) lens. Unthread this ring (counterclockwise, as seen from the eyepiece-end of the viewfinder) by several full turns.
3. Focus of the viewfinder is accomplished by rotating the objective lens cell (1), Fig. 2, in one direction or the other, until distant objects observed through the viewfinder appear sharp. One or two rotations of the viewfinder lens have a significant effect on image focus.
4. Once correct focus is reached, lock the focus in place by threading the knurled lock-ring snugly up against the viewfinder's lens cell.
5. Replace the viewfinder into its bracket on the main telescope.

Alignment of the Viewfinder

In order for the viewfinder to be useful, it must first be aligned with the main telescope, so that both the viewfinder and the main telescope are pointing at precisely the same place. To align the viewfinder follow this procedure:

1. The viewfinder bracket (5), Fig. 2, includes six alignment screws. Turn *the 3 rear-most alignment screws* (6), Fig. 2, so that the viewfinder tube is roughly centered within the viewfinder bracket, as viewed from the eyepiece-end of the telescope.
2. Using the SP 26mm eyepiece, point the main telescope at some easy-to-find, well-defined land object, such as the top of a telephone pole. Center the object precisely in the main telescope's field and lock the R.A. Lock and Dec Lock so that the object can not move in the field.
3. While looking through the viewfinder, turn one or more of *the 3 front-most viewfinder alignment screws* (4), Fig. 2, until the crosshairs of the viewfinder point at precisely the same position as the main telescope.

Re-check that the viewfinder's crosshairs and the main telescope are now pointing at precisely the same object. The viewfinder is now aligned to the main telescope. Unless the alignment screws are disturbed, the viewfinder will remain aligned indefinitely.

Using the Viewfinder

Now, to locate any object, terrestrial or astronomical, first center the object on the crosshairs of the viewfinder; the object will then also be centered in the field of the main telescope.

Note: If you intend to use higher observing magnifications, first locate, center, and focus the object using a low-power eyepiece (e.g., the SP 26mm eyepiece). Objects are easier to locate and center at low powers; higher power eyepieces may then be employed simply by changing eyepieces.

===== OBSERVING OBJECTS =====

Terrestrial Observing

The ETX Astro Telescope makes an excellent, high-resolution land, or terrestrial, telescope. Simply by setting the telescope on its drive base, as shown in Fig. 1, the telescope may be used for an extremely wide range of land observations. Keep in mind, however, that terrestrial images through the ETX Astro Telescope will be right-side-up, but reversed left-for-right. Normally, such an image orientation is not bothersome, unless the observer is trying to read a distant sign, for example. If the telescope is to be used for extensive terrestrial observations, the #932 45° Erecting Prism (page 14), which yields a correctly-oriented image, is recommended.

Viewing terrestrial objects require observers to look along the earth's surface through heat waves. These heat waves often cause degradation of image quality. Low power eyepieces, like the SP 26mm eyepiece provided with the ETX Astro Telescope, magnify these heat waves less than higher powered eyepieces. Therefore, low power eyepieces provide a steadier, higher quality image. If the land image is fuzzy or ill-defined, drop down to a lower power, where the earth's heat waves will not have such a deleterious effect on image quality. Observing in early morning hours, before the earth has built up internal heat, is generally more advantageous than during late-afternoon hours.

Mounting the ETX Astro Telescope for Terrestrial Applications

For use in terrestrial viewing situations the ETX Astro Telescope may be mounted in one of three ways:

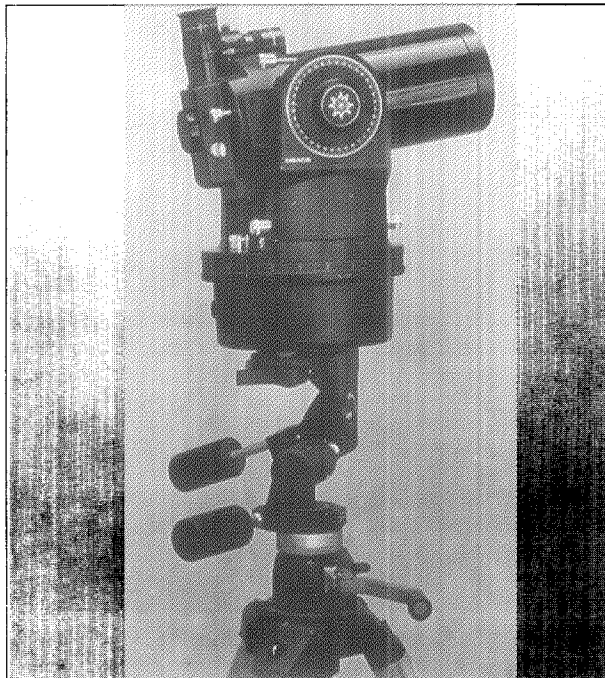


Fig. 5: Placement of the ETX Astro Telescope on a heavy-duty photo tripod.

1. By setting the telescope's drive base on a proper table or other platform, as discussed immediately above and as shown in Fig. 1.
2. Alternately, the entire ETX Astro Telescope, including fork mount, may be attached to a heavy-duty photo tripod (Fig. 5). Attachment to a photo tripod is effected by means of the threaded hole (3), Fig. 3, in the center of the bottom surface of the telescope's drive base. This central hole is threaded with the photo-tripod-standard 1/4-20 thread. *We emphasize, however, that only a strong, heavy-duty photo tripod, designed to accept the weight of the 9 lb. (4.1 kg) ETX Astro Telescope should be used in the above application. Check with the tripod manufacturer to confirm that the intended tripod is designed to carry such a weight safely and securely, before mounting the telescope in this way.*
3. The optical tube assembly of the ETX Astro Telescope may be removed from its fork mounting, allowing the tube assembly to be placed directly on to a standard photo tripod. To remove the tube assembly from its fork mount, use one of the hex-wrenches packed with the telescope to unthread the two attachment screws (19), Fig. 1, located on each side of the optical tube's rear cell. Then carefully slide the tube assembly out of the fork arms *in the direction of the telescope's eyepiece-end*. The ETX's rear-cell includes a tripod adapter plate (8), Fig. 1, for attaching the tube assembly directly to the 1/4-20 thread of any standard photo tripod.

Never use the ETX telescope to look at the Sun! Observing the Sun, even for the shortest fraction of a second, will cause instant and irreversible damage to the eye, as well as physical damage to the telescope itself.

Astronomical Observing

Used as an astronomical instrument, the ETX Astro Telescope allows full use of its many optical and electromechanical capabilities. It is in astronomical applications where the ETX's extremely high level of optical performance is readily visible. The range of observable astronomical objects is, with minor qualification, limited only by the observer's motivation.

Understanding how and where to locate celestial objects, and how those objects move across the sky is fundamental to enjoying the hobby of astronomy. This section provides a basic introduction to the terminology associated with astronomy, and includes instructions for finding and following celestial objects.

Celestial Coordinates: Declination and Right Ascension

Celestial objects are mapped according to a coordinate system on the Celestial Sphere, the imaginary sphere on which all stars appear to be placed. This celestial object mapping system is analogous to the Earth-based coordinate system of latitude and longitude.

The poles of the celestial coordinate system are defined as those two points where the Earth's rotational axis, if extended to infinity, north and south, intersect the celestial sphere. Thus, the North Celestial Pole is that point in the sky where an extension of the Earth's axis through the North Pole intersects the celestial sphere. This point in the sky is located near the North Star, Polaris.

In mapping the surface of the Earth, lines of longitude are drawn between the North and South Poles. Similarly, lines of latitude are drawn in an east-west direction, parallel to the Earth's Equator. The Celestial Equator is a projection of the Earth's Equator onto the celestial sphere.

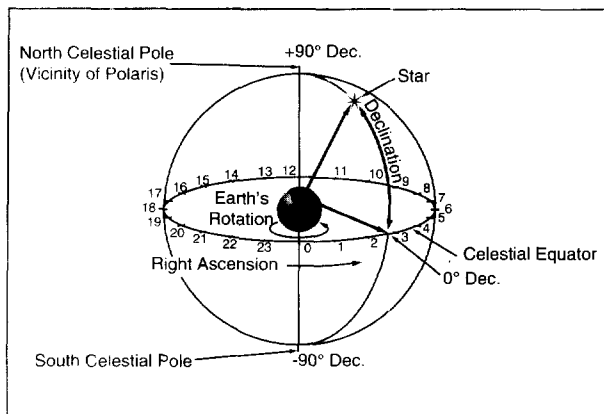


Fig. 6: Celestial Sphere.

Just as on the surface of the Earth, in mapping the celestial sphere imaginary lines have been drawn to form a coordinate grid. Thus, celestial object positions on the Earth's surface are specified by their latitude and longitude. For example, you could locate Los Angeles, California, by its latitude (+34°) and longitude (118°); similarly, you could locate the constellation Ursa Major (which includes the Big Dipper) by its general position on the celestial sphere:

R.A.: 11hr; Dec: +50°.

The celestial analog to Earth latitude is called Declination, or "Dec", and is measured in degrees, minutes and seconds (e.g., 15° 27' 33"). Declination shown as north of the celestial equator is indicated with a "+" sign in front of the measurement (e.g., the Declination of the North Celestial Pole is +90°), with Declination shown as south of the celestial equator indicated with a "-" sign (e.g., the Declination of the South Celestial Pole is -90°). Any point on the celestial equator itself (which, for example, passes through the constellations Orion, Virgo and Aquarius) is specified as having a Declination of zero, shown as 0° 0' 0".

The celestial analog to Earth longitude is called "Right Ascension", or "R.A.," and is measured in time on the 24 hour "clock" and shown in hours ("hr"), minutes ("min") and seconds ("sec") from an arbitrarily defined "zero" line of Right Ascension passing through the constellation Pegasus. Right Ascension coordinates range from 0hr 0min 0sec to 23hr 59min 59sec. Thus there are 24 primary lines of R.A., located at 15 degree intervals along the celestial equator. Objects located further and further east of the prime Right Ascension grid line (0hr 0min 0sec) carry increasing R.A. coordinates.

All celestial objects are specified in position by their celestial coordinates of Right Ascension and Declination. The telescope's Dec and R.A. setting circles (8) and (7), Fig. 7, may be dialed to the coordinates of a specific celestial object, which may then be located without a visual search. However, before you can make use of the telescope's setting circles to locate celestial objects, your telescope must first be polar aligned.

Polar Alignment

The Meade ETX can be used for astronomical observations in the same way as just described for terrestrial observations: simply set the telescope on a tabletop, locate objects through the viewfinder, and then observe through the main telescope. Objects can be tracked, or followed, as they move across the sky by turning one or both of the R.A. and Dec Slow-Motion Controls (10) and (16), Fig. 1. Such usage of the telescope, however, is unnecessarily cumbersome, since, by attaching the Table Tripod legs to the ETX and following a procedure called Polar Alignment, the telescope can be made to track objects completely automatically.

As the earth rotates once on its axis every 24 hours, astronomical objects appear to move across the sky in an arc. This apparent motion is not obvious to the unaided eye, but viewed through a serious telescope such as the ETX, this motion is rapid indeed. Objects centered in the telescope move entirely out of the field of view in 15 to 60 seconds, depending on the magnification employed.

For easy tracking of astronomical objects the ETX should be polar aligned, as follows:

1. Make sure the finderscope is aligned with the ETX Astroscope.
2. Attach the 3 tripod legs to the drive base of the telescope. (See Fig. 7.) Two identical legs thread into the side of the telescope's drive base (first remove the threaded cover-buttons). The third leg, which includes a scribed scale along its length, should be threaded into the center hole of the drive base. The scribed scale reads the latitude of the observing location. Threading in the three legs to a firm feel is sufficient.
3. A small thumbscrew (4), Fig. 7, is attached to the center tripod leg. Loosening this thumbscrew allows the outer section of the leg to slide over the inner section, so that the length of the leg can be extended. *Extend the center tripod leg so that the center of the thumbscrew-head is lined up with the latitude of your location on the scale.* Then retighten the thumbscrew to a firm feel. (The latitude of your observing location can be determined from a road map or atlas; determining your latitude within about one degree is sufficient. See page 12 for latitudes of several major cities.

Example: The latitude of New York City is 41°. The center tripod leg should be extended so that the center of the thumbscrew is set next to the 41° reading on the scale.

Note: With the center tripod leg threaded fully into the center hole of the drive base, the latitude scale may be at an inconvenient position for reading the latitude scale (e.g., the scale may be facing the drive base). This situation can be remedied as follows:

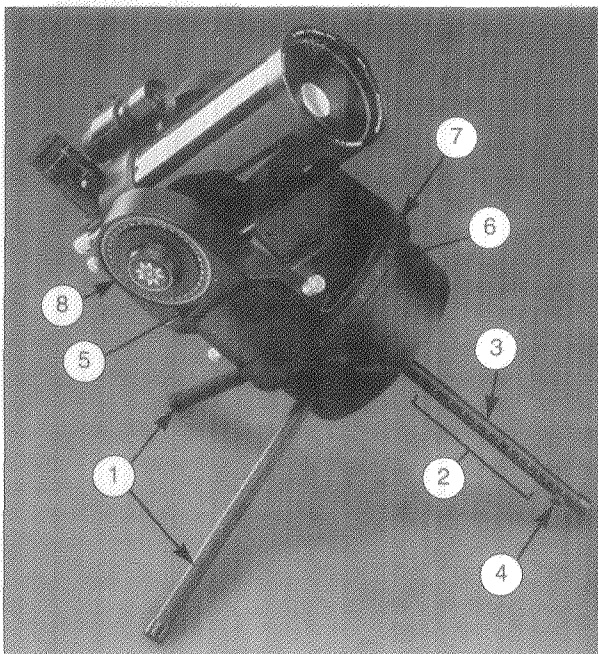


Fig. 7: The ETX ready for astronomical observing. (1) Fixed-length tripod legs; (2) Scribed scale for reading latitude of observing location; (3) Center tripod leg; (4) Thumbscrew for locking extension of center leg; (5) Indicator arrow for Dec. circle; (6) Indicator arrow for R.A. circle; (7) R.A. Setting Circle; (8) Dec. Setting Circle.

- a. Remove the center tripod leg from the telescope's drive base.
 - b. Unthread completely the small thumbscrew which locks the leg's inner section to its outer section.
 - c. Rotate the inner tripod section 180° inside the outer section.
 - d. Replace the thumbscrew which locks the inner section to the outer section.
 - e. Replace the center leg in the drive base. The latitude scale will now be placed at an easily readable position.
4. Unlock the R.A. Lock and Dec Lock and rotate the telescope so that it is oriented as shown in Fig. 8. Re-lock the R.A. Lock and Dec Lock. In this orientation the telescope's optical tube is lined up parallel to the tripod's center leg.

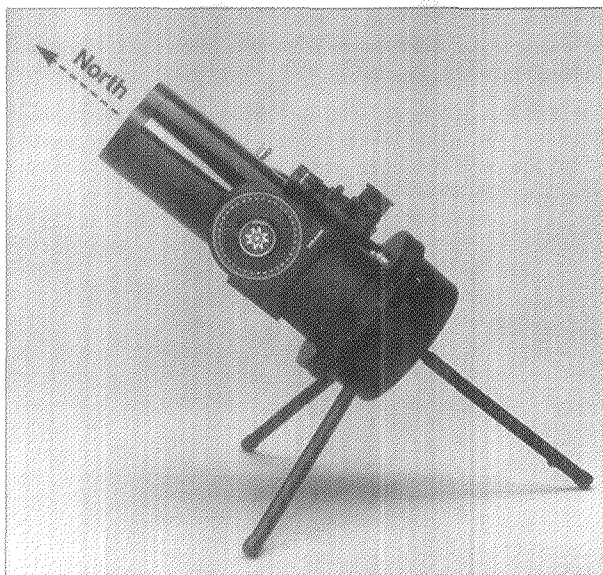


Fig. 8: To polar align the ETX, place the telescope's optical tube parallel to the center tripod leg, as shown. Then lift and orient the entire telescope on a tabletop so that this axis is pointed due North

5. Note the dotted line and arrow extending from the telescope tube in Fig. 8. This line defines the telescope's polar axis. Lift the entire telescope, including tripod, and place the telescope on a tabletop so that this axis is pointed due North. For example, if you know the location of Polaris, the North Star, then point the telescope directly at Polaris. (See Fig. 9.)
- Note: Observer's located in the earth's southern hemisphere (e.g., South America, Australia, etc.) should point the telescope's polar axis due South.*
6. From this point on, only move the telescope using the R.A. and Dec controls. Any other movement of the telescope will nullify the polar alignment procedure.

Polar alignment of the telescope thus requires two procedures: extending the center tripod leg to the correct latitude position and pointing the telescope's polar axis due North.

The center tripod leg has a latitude range of from 27.5° to 42.5°. Observers located at latitudes higher than 42.5° may achieve equatorial alignment by placing the center tripod leg in the upper hole position (2), Fig. 3. Polar alignment may in this way be achieved to latitudes as high as 48°. Note, however, that the latitude scale on the center tripod leg no longer is valid when the leg is placed in the upper hole position. In this case the center tripod leg should be extended until the telescope's polar axis points to Polaris, or due North, an alignment obtained by

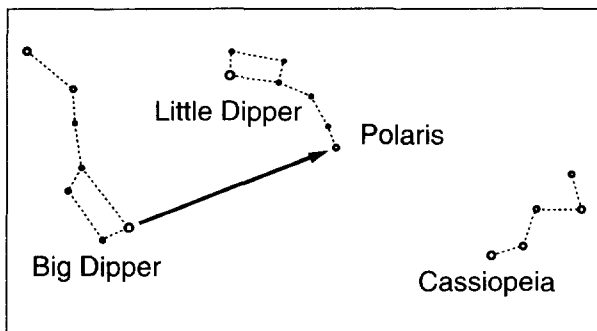


Fig. 9: Locating Polaris

sighting along the telescope tube with the telescope oriented as shown in Fig. 8.

If the observing location is at latitudes below 27.5°, the telescope can be polar aligned by placing the center tripod leg in the lower hole position 4, Fig. 3. Again, polar alignment can be obtained by sighting along the telescope tube, per the orientation in Fig. 8, and extending the center tripod leg so that the telescope's polar axis points to Polaris. Polar alignment at latitudes as low as 22° may be achieved in this way.

If your observing latitude is higher than 48°, the optional High-Latitude Tripod Leg (pages 14-15) is available and allows for polar alignment to latitudes as high as 66°.

An important note: For almost all astronomical observing requirements approximate settings of the telescope's latitude and polar axis are acceptable! Do not allow undue attention to precise polar alignment of the telescope interfere with your basic enjoyment of the instrument.

An Alternate Polar Alignment Procedure

If desired, more precise polar alignment (particularly if your latitude requires that you use the upper or lower hole positions, (2) and (4), Fig. 3, for attachment of the center tripod leg) may be obtained by first orienting the telescope as shown in Fig. 8. Use the R.A. Slow-Motion Control to move the telescope so that the eyepiece is positioned as shown in Fig. 8. Then follow this procedure:

1. Align the telescope's optical tube by your eye so that it is parallel to the telescope's center tripod leg. Use the Dec Slow-Motion Control (16), Fig. 1, to make the optical tube and center tripod leg as nearly parallel to each other as your eye can detect, as shown in Fig. 8.
2. Lift the entire telescope, including tripod, and place it on the observing table so that the telescope's polar axis, as indicated by the dotted arrow in Fig. 8, is pointing due North.
3. While observing through the SP 26mm eyepiece of the main telescope, adjust the length of the center tripod leg until Polaris is visible in the eyepiece. Do not use the R.A. and Dec Slow Motion Controls. Instead, use a combination of (a) lifting and turning the entire telescope (or nudging the position of one of the fixed tripod legs) and (b) adjusting the length of the center tripod leg to place Polaris in the center of the telescope's field.

Although the above procedure is somewhat tedious (since the actual field of view of the main telescope with the SP 26mm eyepiece in place is only about 1°), it is a worthwhile effort if fairly precise polar alignment is desired—e.g., if photography of the Moon or a planet is to be performed. With Polaris placed in the center of the telescope's field, the telescope will be polar aligned within about one or two degrees - a level of alignment precision more than sufficient for almost any observing application.

Locating Astronomical Objects

Now that your telescope is fully assembled and polar aligned, you are ready to begin observations.

For the beginning amateur astronomer, the simplest method of locating objects in the night sky - and an excellent way to learn how to operate your telescope - is to look at a celestial object that can be clearly seen with your own eyes.

To move the telescope freely in R.A. and Dec, first loosen both the R.A. and Dec Locks. Find the desired object in the viewfinder, center the object in the viewfinder's crosshairs, then observe through the main telescope's eyepiece. Tighten the R.A. and Dec locks. Then, adjust the focus knob until the image is clear and sharp.

The positions of celestial objects change over the course of the year, so you should obtain a star chart - such as the Meade Star Charts, available from your Meade dealer - or refer to the monthly star charts presented in astronomy magazines, such as *Sky & Telescope* and *Astronomy*.

Once the object is centered in the eyepiece, it is necessary to slowly turn the R.A. Slow-Motion Control (10), Fig. 1, to keep the object in the field of view. However, once the telescope is polar aligned, the motor drive (described below) may be used to automatically track on the object.

The Motor Drive

The ETX Astro Telescope is driven by a DC electronic motor control system, powered by three AA-size batteries located inside the telescope's drive base. (Recall that these batteries were installed per the instructions on page 4 of this manual.)

To use the motor drive, follow this procedure:

1. With the telescope polar aligned as described above, turn the motor drive on, using the switch (8), Fig. 3, located on the bottom of the drive base.
2. Northern/Southern Hemisphere Operations: Observers located in the earth's northern hemisphere (e.g., North America, Europe, Japan) should place the N-S switch (7), Fig. 3, permanently in the "N" (north) position. Observers in the earth's southern hemisphere (e.g., Australia and most of South America) should place this switch in the "S" position, resulting in motor drive operation in the opposite direction.
3. After switching the motor drive on, allow one minute for the drive to take up any internal gear-backlash. During this initial one minute period, the motor drive is non-operative.
4. Now, as you move the telescope from object to object, the motor drive will automatically track, or follow, the object, fully compensating for the effects of the earth's rotation. When each new object is centered in the telescope's field, the R.A. Lock and Dec Lock should be locked; the motor drive takes hold within a few seconds after the R.A. Lock is locked.

Setting Circles: Scales on the Telescope Used to Aid in the Location of Faint Objects

Sky catalogs specify object positions by their R.A. (in hours, minutes, and seconds, from 0h 0m 0sec to 23h 59m 59sec) and Dec (from 0° to ± 90°) coordinates. By using the setting circles (15) and (18), Fig. 1, on the ETX, it is possible to locate faint objects directly from their catalogued coordinates of R.A. and Dec.

With the ETX telescope polar aligned, turning the R.A. Slow-Motion Control moves the telescope in Right Ascension; turning the Dec Slow-Motion Control moves the telescope in Declination.

The Dec setting circle has been factory set to read the correct Declination of sky objects, but this setting should be re-checked the first time the setting circles are used. With the telescope polar aligned, point the telescope as shown in Fig. 8 and center the North Star, Polaris, in the telescopic field. Polaris has a Declination of 89.2°. With Polaris centered in the field of view, both Dec setting circles should therefore read 89.2°, using the small indicator arrow (5), Fig. 7, located immediately under each Declination circle. The Dec setting circles can be moved by slightly unthreading their cover plates, adjusting the circle positions, and then retightening the cover plates.

Since celestial objects move in Right Ascension, the R.A. setting circle must be set as each object is located during an observing session. This point is explained in more detail below.

Note that the R.A. circle has two rows of numbers from 0 to 23, corresponding to the hours of a 24-hour clock. The upper row of numbers should be used by observers in the earth's northern hemisphere, the lower row by observers in the earth's southern hemisphere.

The indicator arrow (6), Fig. 7, for the R.A. setting circle is located on the opposite side of the drive base from the position where the two fixed table tripod legs attach and immediately under the R.A. circle.

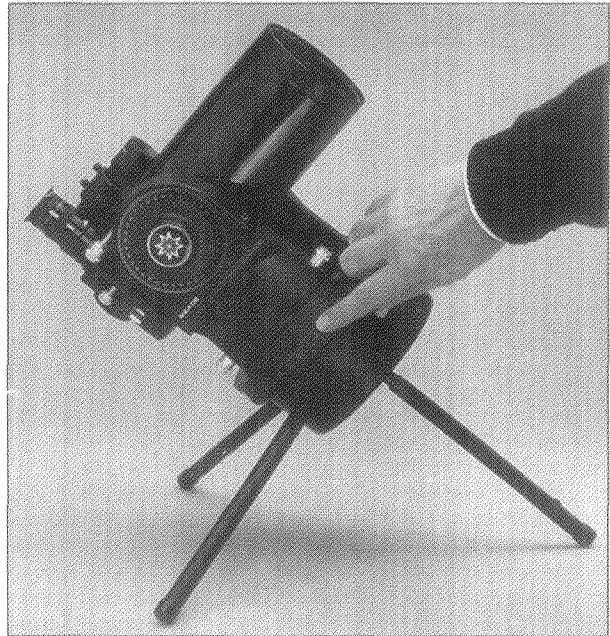


Fig. 10: Manually turning the R.A. setting circle to read the Right Ascension of an object.

To use the setting circles, the ETX must first be polar aligned; it is advisable that the motor drive be turned on and that a low-power eyepiece (e.g., the SP 26mm eyepiece) be employed. Then follow this procedure:

1. Identify the celestial coordinates (R.A. and Dec) of a bright, easy-to-find object, such as a bright star. (Avoid using Polaris or any object near Polaris.) Coordinates of some bright stars are listed on page 12, or use a sky catalog. Center this object in the telescope's field of view.
2. Manually turn the R.A. circle (Fig. 10) to read the R.A. of the object.
3. The R.A. circle is now calibrated to read the correct R.A. of any object at which the telescope is pointed. The Dec circle is already calibrated as described above.
4. Without touching the setting circles, move the telescope (manually, by unlocking the R.A. and Dec Locks, or by

using the R.A. and Dec Slow-Motion Controls) so that the setting circle indicators (5) and (6), Fig. 7, read the R.A. and Dec coordinates of a second object that you wish to locate. The coordinates of this second object should be taken from a sky catalog or from the list on page 12.

- 5 If the above procedure has been followed carefully, the second object should now be in the telescope's field of view

Note: Since the second object (i.e., the object to be located) is in constant motion, once the R.A. circle is calibrated (step 2, above), the telescope should be moved rapidly to read the coordinates of the second object. Otherwise the second object will no longer be in the position indicated by the R.A. circle.

Using setting circles requires a developed technique. When using the circles for the first time, try hopping from one bright star (the calibration star) to another bright star of known coordinates. Practice moving the telescope from one easy-to-find object to another easy-to-find object. In this way the precision required for accurate object location will become evident.

Photography through the ETX Astro Telescope

Photography through the ETX Astro Telescope requires the addition of the optional #64 T-Adapter. With the #64 T-Adapter attached to the telescope (Fig. 11), through-the-telescope photography is possible with any 35mm camera body with removable lens. In this way the telescope effectively becomes the lens of the camera.

For through-the-telescope photography, turn the Flip-Mirror Control, (7), Fig. 1, to the "down" position, allowing light to pass straight-through the telescope and out the Photo Port (6), Fig. 1. With the Flip-Mirror Control in the "down" position and the Photo Port's dust cover removed, the front lens of the telescope can be seen when looking through the Photo Port. The #64 T-Adapter threads on to the Photo Port, followed by a T-Mount for the particular brand of 35mm camera being used, followed in turn by the camera body itself (with camera lens removed).

Note that the #64 T-Adapter consists of two sections (1) and (2), Fig. 11, which are threaded together in shipment. Either of the following photographic formats may be employed for coupling of the camera body to the telescope's Photo Port thread:

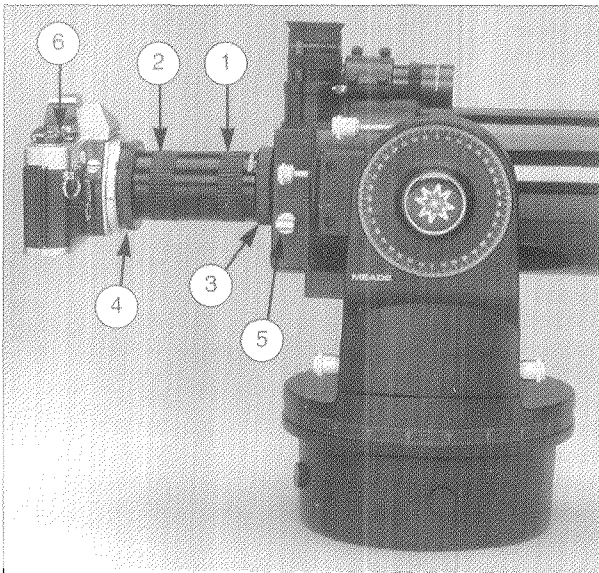


Fig. 11: Using the #64 T-Adapter. (1) Short section of #64 T-Adapter; (2) Extension section of #64 T-Adapter; (3) Knurled attachment ring; (4) T-Mount; (5) Flip-Mirror Control in "down" position; (6) 35mm camera body.

Camera Body + T-Mount + Section (1) of the #64 T-Adapter; or

Camera Body + T-Mount + Sections (1) and (2) of the #64 T-Adapter.

The first format listed above, using the short section only, of the #64 T-Adapter, permits close-coupling of a camera body to the telescope at an effective photographic speed of f/14 and a transmission value (the so-called "T"-value) of 18. In this format vignetting will occur: the photographic image will appear on film as a circle, without illuminating the complete 35mm frame.

In the second format listed above, with both sections of the #64 T-Adapter threaded together to form a rigid unit as shown in Fig. 11, the telescope is operating at a photographic speed of f/16 and T-value of 23, but without any field vignetting: images are illuminated to the edges of a standard 35mm frame.

To frame an object in the viewfinder of the 35mm camera body, loosen slightly the knurled ring (3), Fig. 11, which threads the #64 T-Adapter to the telescope's Photo Port; rotate the camera body to achieve proper framing of the object; then re-tighten the knurled ring.

Photography through a long lens such as the ETX requires special technique for good results, and the photographer should probably expect to waste a roll or two of film in acquiring this technique. Long-lens photography has its own rewards, however; rewards that short-focus lenses can not duplicate.

A few tips on photography through the ETX:

1. Use a rigid tabletop or the optional Meade ETX Tilt Plate tripod as a platform for the telescope. At effective focal lengths of 1250mm to 1450mm, even small external vibrations can easily ruin an otherwise good photo.
2. Use a cable-operated shutter release. Touching the camera body to initiate shutter operation will almost certainly introduce undesirable vibrations.
3. Focus the image with extreme care. While observing the subject through the camera's reflex viewfinder, turn the ETX's focuser knob to achieve the sharpest possible focus.
4. Correct shutter speeds vary widely, depending on lighting conditions and the film used. Trial-and-error is the best way to determine the proper shutter speed in any given application.
5. Terrestrial photography through the ETX is sensitive to heat waves rising from the earth's surface. Long distance photography is best accomplished in the early morning hours, before the earth has had time to build up heat.
6. Photography of the Moon and planets through the ETX can be especially gratifying, but points 1 through 4 should be particularly noted in this case. Lunar or planetary photography requires that the telescope be polar aligned (see page 8 and Fig. 14) and that the telescope's motor drive be in operation.

Note that long-exposure photography of deep-space objects is not practical with the ETX, since this type of photography requires special electronic and optical guiding devices not available for this telescope.

Objects In Space

Listed below are just some of the many astronomical objects that can be seen with your ETX Astro Telescope:

The Moon

The Moon is, on average, a distance of 230,000 miles (370,000km) from Earth and is the easiest object to view at night. It is best observed during its crescent or half phase, when sunlight strikes its surface at an angle, casting shadows and

adding a sense of depth to your view. No shadows are seen during a full Moon, causing the overly bright Moon to appear flat. Using your new ETX Astro Telescope, you can see brilliant detail on the Moon, including many hundreds of lunar craters and maria, described below:

Craters are round meteor impact sites covering most of the Moon's surface. With no atmosphere on the Moon, no weather conditions exist to erode the craters. Thus, lunar craters can last for millions of years.

Maria (plural for mare) are smooth, dark areas scattered across the lunar surface. These dark areas are thought to be ancient impact craters that were filled with lava from the interior of the Moon.

In the late 1960's and early 1970's, a total of 12 Apollo astronauts left their footprints on the Moon. However, no telescope on Earth is able to see these footprints. In fact, the smallest lunar feature that can be seen with the largest telescope on Earth is about half a mile across.

Planets

Planets change positions in the sky as they orbit around the Sun. To locate the planets on a given day or month, consult a monthly astronomy magazine, such as *Sky and Telescope* or *Astronomy*. Listed below are the best planets for viewing through your ETX Astro Telescope.

Venus is about 0.9 times the diameter of Earth. As Venus orbits the Sun, observers can see it go through phases (crescent, half, and full) much like those of the Moon. The disk of Venus appears white as sunlight is reflected off its thick cloud cover.

Mars is about 0.5 times the diameter of Earth. Mars appears as a tiny reddish-orange dot. It may be possible to see a hint of white at one of the planet's polar ice caps. When Mars is closest to Earth, additional detail on the planet's surface may be visible.

Jupiter is 11 times the diameter of Earth. This large planet appears as a disk with several dark lines stretching across its surface. These dark lines are cloud bands in Jupiter's atmosphere. Four of Jupiter's 16 moons (Io, Europa, Ganymede, and Callisto) can be seen as "star-like" points of light. Just as Earth's Moon travels around Earth, Jupiter's moons circle around Jupiter. As a result, the number of moons visible at any given time changes as they orbit in front of or behind the giant planet.

Jupiter is the largest planet in the solar system. While Jupiter's disk may look small through the telescope, keep in mind that over 1000 Earths could fit inside the planet.

Saturn is 9 times the diameter of Earth and appears as a small, round disk with rings extending out from either side. In 1610, Galileo, the first person to observe Saturn through a telescope, didn't understand what the rings were and believed instead that Saturn had "ears". Saturn's rings are made of billions of ice particles ranging in size from a speck of dust to the size of a house. The major division in Saturn's rings, called the Cassini Division, is generally visible through the ETX. Titan, the largest of Saturn's 18 moons can also be seen through the ETX as a bright, star-like object near the planet.

Deep Sky Objects...Beyond Our Solar System

Star charts can be used to locate constellations, individual stars and deep sky objects. Examples of various deep sky objects are given below:

Stars are large globes of incandescent gases. Because of their vast distances from our solar system, all stars appear as pinpoints of light, irrespective of the size of the telescope used.

Diffuse Nebulae are clouds of dust and gas where stars are formed. The Great Nebula in Orion (M42) is a diffuse nebula that appears as a faint wispy gray cloud. M42 is 1600 light years in distance from Earth.

Spiral Galaxies are large pin-wheel shaped groupings of stars, nebulae, clusters and more. The Andromeda Galaxy (M31) is the closest spiral-type galaxy to the Milky Way. This galaxy appears faint, fuzzy, and cigar-shaped, is 2.2 million light years away and is a fascinating object to see through the ETX.

Open Clusters are loose groupings of young stars, all recently formed from the same diffuse nebula. The Pleiades (M45) in Taurus is an open cluster. M45 is 410 light years away. Through the ETX several hundred stars are visible in the Pleiades.

Constellations are large, imaginary groupings of stars and are too large to be seen through a telescope. To learn the constellations, start with an easy grouping of stars, like the Big Dipper in Ursa Major. Then, use a star chart to find your way from there.

Helpful Charts

Latitudes of the World

To aid in the polar alignment procedure (page 8), latitudes of major cities around the world are listed below. To determine the latitude of an observing site not listed on the chart, locate the city closest to your site.

For observers in the northern hemisphere (N): If your site is over 70 miles (110 km) north of the listed city, add one degree for every 70 miles. If your site is over 70 miles south of the listed city, subtract one degree per 70 miles.

For observers in the southern hemisphere (S): If your site is over 70 miles north of the listed city, subtract one degree for every 70 miles. If your site is over 70 miles south of the listed city, add one degree per 70 miles.

UNITED STATES

City	State	Latitude
Albuquerque	New Mexico	35° N
Anchorage	Alaska	61° N
Atlanta	Georgia	34° N
Boston	Massachusetts	42° N
Chicago	Illinois	42° N
Cleveland	Ohio	41° N
Dallas	Texas	33° N
Denver	Colorado	40° N
Detroit	Michigan	42° N
Honolulu	Hawaii	21° N
Jackson	Mississippi	32° N
Kansas City	Missouri	39° N
Las Vegas	Nevada	36° N
Little Rock	Arkansas	35° N
Los Angeles	California	34° N
Miami	Florida	26° N
Milwaukee	Wisconsin	46° N
Nashville	Tennessee	36° N
New Orleans	Louisiana	30° N
New York	New York	41° N
Oklahoma City	Oklahoma	35° N
Philadelphia	Pennsylvania	40° N
Phoenix	Arizona	33° N
Portland	Oregon	46° N
Richmond	Virginia	37° N
Salt Lake City	Utah	41° N
San Antonio	Texas	29° N
San Diego	California	33° N
San Francisco	California	38° N
Seattle	Washington	47° N
Washington	District of Columbia	39° N
Wichita	Kansas	38° N

SOUTH AMERICA

City	Country	Latitude
Asuncion	Paraguay	25° S
Brasilia	Brazil	24° S

Buenos Aires	Argentina	35° S
Montevideo	Uruguay	35° N
Santiago	Chili	34° S

EUROPE

City	Country	Latitude
Amsterdam	Netherlands	52° N
Athens	Greece	38° N
Bern	Switzerland	47° N
Copenhagen	Denmark	56° N
Dublin	Ireland	53° N
Frankfurt	Germany	50° N
Glasgow	Scotland	56° N
Helsinki	Finland	60° N
Lisbon	Portugal	39° N
London	England	51° N
Madrid	Spain	40° N
Oslo	Norway	60° N
Paris	France	49° N
Rome	Italy	42° N
Stockholm	Sweden	59° N
Vienna	Austria	48° N
Warsaw	Poland	52° N

ASIA

City	Country	Latitude
Beijing	China	40° N
Seoul	South Korea	37° N
Taipei	Taiwan	25° N
Tokyo	Japan	36° N
Victoria	Hong Kong	23° N

AFRICA

City	Country	Latitude
Cairo	Egypt	30° N
Cape Town	South Africa	34° S
Rabat	Morocco	34° N
Tunis	Tunisia	37° N
Windhoek	Nambia	23° S

AUSTRALIA

City	Territory	Latitude
Adelaide	South Australia	35° S
Brisbane	Queensland	27° S
Canberra	New South Wales	35° S
Alice Springs	Northern Territory	24° S
Hobart	Tasmania	43° S
Perth	Western Australia	32° S
Sydney	New South Wales	34° S
Melbourne	Victoria	38° S

Star Locator

Following are a list of bright stars and their R.A. and Dec coordinates. Once your telescope is polar aligned, use the R.A. and Dec setting circles to explore the sky.

Season	Star Name	Constellation	R.A.	Dec
Spring	Arcturus	Bootes	14h16m	19° 11"
Spring	Regulus	Leo	10h09m	11° 58"
Spring	Spica	Virgo	13h25h	-11° 10"
Summer	Vega	Lyra	18h37m	38° 47"
Summer	Deneb	Cygnus	20h41m	45° 17"
Summer	Altair	Aquilla	19h51m	08° 52"
Summer	Antares	Scorpius	16h30m	-26° 26"
Fall	Markab	Pegasus	23h05m	15° 12"
Fall	Fomalhaut	Piscis Austrinis	22h58m	-29° 38"
Fall	Mira	Cetus	02h19m	-02° 58"
Winter	Rigel	Orion	05h15m	-08° 12"
Winter	Betelgeuse	Orion	05h55m	07° 25"
Winter	Sirius	Canis Major	06h45m	-16° 43"
Winter	Aldebaran	Taurus	04h35m	16° 31"

OPTIONAL ACCESSORIES

A wide assortment of professional Meade accessories is available for the ETX Astro Telescope. The premium quality of these accessories is well-suited to the quality of the instrument itself.

Eyepieces

Meade Super Plössl (SP), Super Wide Angle (SWA), and Ultra Wide Angle (UWA) Eyepieces in the standard American-size (1.25") barrel diameter (Fig. 12) permit a range of magnifying powers with the telescope. Powers obtained with each eyepiece are as follows:

Eyepiece	Magnifying Power	With #126 2x Barlow Lens
SP 6.4mm	195X	390X**
SP 9.7mm	129X	258X
SP 12.4mm	101X	202X
SP 15mm	83X	166X
SP 20mm	63X	126X
SP 26mm*	48X	96X
SP 32mm	39X	78X
SP 40mm	31X	62X
SWA 13.8mm	91X	182X
SWA 18mm	69X	138X
SWA 24.5mm	51X	102X
UWA 4.7mm	266X	N/A
UWA 6.7mm	187X	374X**

* Included as standard equipment with the ETX Astro Telescope.

** Use these eyepieces only under extremely steady atmospheric conditions.

Meade Super Plössl and Super Wide Angle Eyepieces are ideal for general-purpose astronomical or terrestrial observing. The typical ETX user may wish to add 2 or 3 of these eyepieces to his or her telescope. An introductory selection might include the SP 9.7mm and SP 15mm. The more advanced observer will perhaps select the SP 9.7mm, SP 12.4mm, and SWA 18mm. The Super Wide Angle Eyepiece series yields extremely wide fields of view, perfect for the examination of star fields, diffuse nebulae, or for terrestrial applications. Under very steady seeing conditions Meade UWA 4.7mm and 6.7mm eyepieces present the widest fields of view obtainable at high powers and are excellent eyepieces for the Moon and planets.

#126 2x Barlow Lens

An amplifying lens, the #126 2x Barlow (Fig.13) doubles the powers of all eyepieces with which it is used. Insert the #126 into the telescope's eyepiece-holder first, followed by an eyepiece. *Example:* The SP 26mm eyepiece yields a power of



Fig. 12: Optional eyepieces yield higher and lower magnifying powers with the telescope.

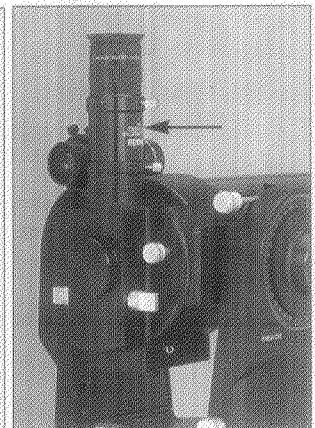


Fig. 13: The #126 2x Barlow Lens (arrow) is used with an eyepiece to double the eyepiece power.

48X with the ETX telescope; when used in conjunction with the #126 2x Barlow Lens, this eyepiece yields 96X.

The Meade #126 is an achromatic, high-performance, short-focus Barlow Lens, perfectly suited to the low-profile design of the ETX telescope.

#64 T-Adapter

The optional #64 T-Adapter (see Fig. 11) is the basic means of photography through the ETX Astro Telescope (see Fig. 11). The adapter threads to the rear cell of the telescope, followed by a T-mount that is appropriate for your brand of 35mm camera. T-mounts are available through your local Meade dealer or from a camera store. With the #64 T-Adapter and T-Mount in place, the camera body becomes rigidly coupled to the telescope's optical system, which in effect becomes the camera's lens.

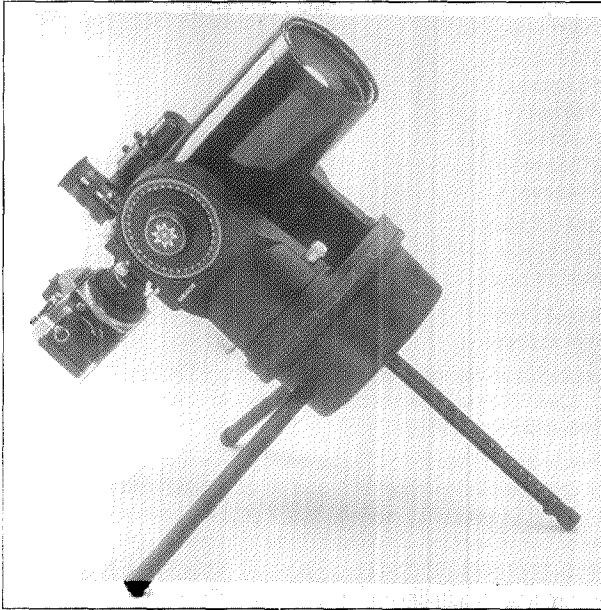


Fig. 14: Astronomical photography with the #64 T-Adapter.

#932 45° Erecting Prism

If the ETX Astro Telescope is to be used for extensive terrestrial applications, the #932 45° Erecting Prism, Fig. 15, is a useful accessory. Images through the 90° eyepiece-holder (4), Fig. 1,

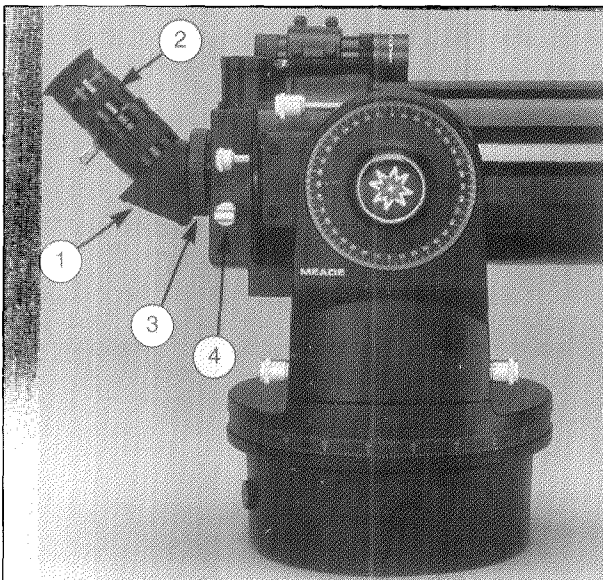


Fig. 15: The #932 45° Erecting Prism threaded on to the rear cell of the ETX. (1) #932 45° Erecting Prism; (2) Eyepiece; (3) Knurled lock-ring; (4) Flip-Mirror Control in "down" position.

appear right-side-up, but reversed left for right. The #932 Prism threads on to the telescope's Photo Port and presents a correctly oriented image in both directions. Note that the Flip-Mirror Control must be in the "down" position for use with the #932 Prism.

Important Note: In the most discriminating applications, such as in observing delicate bird feather-structure at long distance, the ETX's internal, optically-flat mirror yields a higher-resolution image than is possible with any prism, including the #932. In these special cases ETX users are advised to observe with the eyepiece in the standard 90° eyepiece-holder (as shown in Fig. 1), with the Flip-Mirror Control in the "up" position. This admonition applies only to situations requiring extraordinarily high optical resolution and where the observer's eye is well-trained to observe very fine detail. In typical terrestrial applications, no image differences between the two eyepiece locations will generally be noted.

The ETX Carry Bag

Perfectly suited to field use of, or traveling with, the telescope, the soft-padded, Cordura-type ETX Astro Telescope Carry Bag, Fig. 16, includes a shoulder strap and permits ready transport of the complete telescope, including table tripod, eyepiece, and other optional accessories. With the Carry Bag the ETX Astro Telescope can be hand-carried aboard an aircraft.



Fig. 16: The ETX Carry Bag.

High-Latitude Tripod Leg

The standard-equipment tripod leg for latitude adjustment allows for polar alignment of the telescope to latitudes as high as 48°. At higher observing latitudes the High-Latitude Tripod Leg is required.

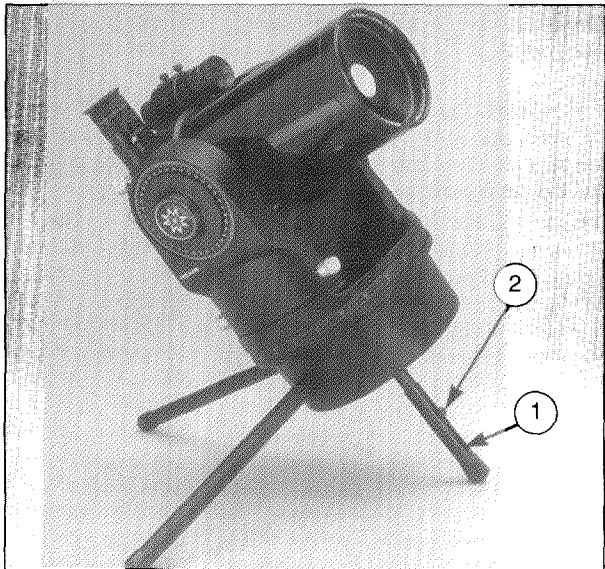


Fig. 17: (1) High-Latitude Tripod Leg; (2) Thumbscrew lock.

With the High-Latitude Tripod Leg threaded into the ETX drive base, the telescope may be polar aligned at the following latitude ranges (refer to Fig. 3):

- Threaded into lower hole position: 44° to 55°
- Threaded into center hole position: 51° to 61°
- Threaded into upper hole position: 56° to 66°

#905 Variable Polarizing Filter

For glare-reduction in observing the Moon the #905 Variable Polarizer, Fig. 18, includes two Polarizer filters mounted in a specially-machined cell. The #905 permits variable settings of light transmission between 5% and 25%, to account for varying lunar surface brightness according to the phase of the Moon. Accepts 1.25" barrel-diameter eyepieces.

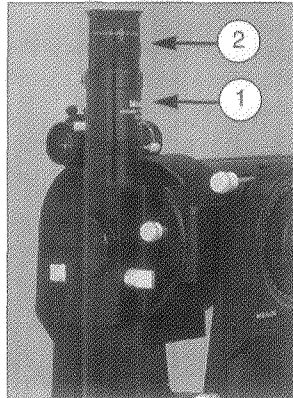


Fig. 18: (1) #905 Variable Polarizing Filter; (2) Eyepiece.

TELESCOPE MAINTENANCE AND SERVICING

General Maintenance

The ETX Telescope is a precision optical instrument designed to yield a lifetime of rewarding applications. Given the care and respect due any precision instrument, the ETX will rarely, if ever, require factory servicing or maintenance. Maintenance guidelines include:

1. Avoid cleaning the telescope's optics: a little dust on the front surface of the telescope's correcting lens causes virtually no degradation of image quality and should not be considered reason to clean the lens.
2. When absolutely necessary, dust on the front lens should be removed with very gentle strokes of a camel's hair brush or blown off with an ear syringe (available at any pharmacy).
3. Organic materials (*e.g.*, fingerprints) on the front lens may be removed with a photographic lens cleaner solution, using soft, white facial tissues. Make short, gentle strokes and change tissues often.
4. In the very rare situation where cleaning the inside surface of the corrector lens becomes necessary, unthread the lens cell located at the front of the main tube. The entire correcting lens and secondary mirror system is mounted in this cell. Photographic lens cleaner solution, as above, may be used to clean the inside surface of the lens. **But do not touch the aluminized circular surface of the secondary mirror with your finger, a tissue, or any other object.** Scratching of the mirror surface will otherwise almost certainly result.

Note: When cleaning the inside surface of the correcting lens, leave the lens mounted in its metal cell throughout the process. Do not remove the lens from its metal housing or else optical alignment of the lens will be lost, necessitating a return of the telescope to the Meade factory.

5. If the ETX is used outdoors on a humid night, water condensation on the telescope surfaces will probably result. While such condensation does not normally cause any damage to the telescope, it is recommended that the

entire telescope be wiped down with a dry cloth before the telescope is packed away. Do not, however, wipe any of the optical surfaces. Rather, simply allow the telescope to sit for some time in the warm indoor air, so that the wet optical surfaces can dry unattended.

6. If the ETX Telescope is not to be used for an extended period, perhaps for one month or more, it is advisable to remove the three AA-batteries from inside the drive base. Batteries left in the circuit board for prolonged periods may leak, causing damage to the telescope's electronic circuitry.
7. The super-gloss anodized finish of the ETX's deep-violet optical tube will fade if left in direct sunlight for prolonged periods.
8. Do not leave the ETX telescope inside a sealed car on a warm summer day; excessive ambient temperatures can damage the telescope's internal lubrication and electronic circuitry.
9. A set of three (English-format) hex wrenches is provided with each ETX Astro Telescope.

Small wrench (.050"): Use the small wrench to tighten the set-screws of any knobs which may loosen; *e.g.*, the Dec Slow-Motion Control knob, Focuser knob, R.A. Lock, R.A. Slow-Motion Control knob, or Flip-Mirror Control knob.

Medium wrench (1/16"): This wrench is used to detach the viewfinder bracket from the telescope's rear-cell.

Large wrench (7/64"): As explained on page 7 of this manual, the large wrench is used to detach the ETX optical tube assembly from its fork mount, permitting placement of the tube assembly on a standard photo tripod.

Proper Storage and Transport of the Telescope

When not in use, store the telescope in a cool, dry place. Do not expose the instrument to excessive heat or moisture. It is best to store the telescope in its original box. If shipping the telescope, use the original box and packing material to protect the telescope during shipment.

When transporting the telescope, take care not to bump or drop the instrument; this type of abuse can damage the optical tube and/or the objective lens.

Inspecting the Optics:

A Note about the "Flashlight" Test

If a flashlight or other high-intensity light source is pointed down the main telescope tube, the view (depending upon the observer's line of sight and the angle of the light) may reveal what appears to be scratches, dark or bright spots, or just generally uneven coatings, giving the appearance of poor quality optics. These effects are only seen when a high intensity light is transmitted through lenses or reflected off the mirrors, and can be seen on any high quality optical system, including giant research telescopes.

The optical quality of a telescope cannot be judged by the "flashlight" test; the true test of optical quality can only be conducted through careful star testing.

Troubleshooting

The following suggestions may be helpful if you are having difficulty observing objects through the ETX Astro Telescope:

1. Confirm that all the lens or mirror covers have been removed from the telescope.
2. Confirm that the Flip-Mirror Control (7), Fig. 1, is in the "up" position so light is directed to the eyepiece (1), Fig. 1.

- 3. If you are new to stargazing, first locate and focus on bright objects, such as the Moon, or a bright star or planet, to acquaint yourself with the sky.

Never use the ETX telescope to look at the Sun! Observing the Sun, even for the shortest fraction of a second, will cause instant and irreversible damage to the eye, as well as physical damage to the telescope itself.

- 4. When objects appear in the viewfinder but not in the telescope, the viewfinder is not properly aligned with the telescope. Before the ETX is used the first time, the viewfinder must be aligned to the main telescope, as described on page 6. Once aligned, locate objects in the viewfinder first, then move to the main telescope.
- 5. Air conditions inside a warm house or building may distort celestial images and make it difficult, if not impossible, to obtain a sharp focus. For optimal viewing, use the telescope outside in the open air instead of observing through an open or closed window or screen.
- 6. For clear viewing of objects, turn the focus knob slowly since the "in-focus" point of a telescope is precise.
- 7. The optics within your telescope need time to adjust to the outside temperature to provide the sharpest image. To "cool down" the optics, set your telescope outside for 10 to 15 minutes before you begin observing.

Meade Customer Service

If you have a question concerning your ETX telescope, call Meade Instruments Customer Service Department at 714-451-1450, or fax at 714-451-1460. Customer Service hours are 8:30AM - 4:00PM, Pacific Time, Monday through Friday. In the unlikely event that your ETX requires factory servicing or repairs, **write or call the Meade Customer Service Department first, before returning the telescope to the factory**, giving full particulars as to the nature of the problem, as well as your name, address, and daytime telephone number. The great majority of servicing issues can be resolved by telephone, avoiding return of the telescope to the factory.

Specifications - ETX Astro Telescope

Optical design	Maksutov-Cassegrain
Clear aperture	90mm (3.5")
Focal length	1250mm
Focal ratio (photographic speed)	f/13.8
Near focus	11.5 ft (3.5m)
Resolving power	1.3 arc secs
Super multi-coatings	standard
Limiting visual stellar magnitude	11.7
Maximum practical visual power	325X
Optical tube dimensions	4.1" dia. x 11" long (10.4cm x 27.9cm)
Secondary mirror obstruction	1.1" (27.9mm); 9.6%
Telescope mounting	fork type; double tine
RA drive motor	4.5-volts DC
Hemispheres of operation	north and south, switchable
Slow-motion controls	manual; R.A. and Dec
Bearings	R.A. and Dec: Nylon
Materials:	
Tube body	aluminum
Mounting	high-impact ABS, steel-reinforced
Primary mirror	Pyrex® glass
Correcting lens	BK7 optical glass, Grade-A
Telescope dimensions	15" x 7" x 9" (38cm x 18cm x 22cm)
Telescope (incl. tripod) net weight	9.2 lbs (4.2kg)
Telescope shipping weight	12.4 lbs (5.6kg)

INTRODUCTION

THE ETX SPOTTING SCOPE

For high-magnification, high-resolution observation of terrestrial subjects, the Meade ETX Spotting Scope is one of the finest telescopes ever developed at any price. Explore the subtleties of a bird's feather structure from 50 yards; read license plates more than one mile in the distance; or use the ETX Spotting Scope for casual astronomical purposes. Applications of the ETX are almost limitless.

Note: "Spotting Scope" is a term used to define a telescope that is primarily intended for land-viewing, as opposed to

astronomical applications. Notwithstanding this definition, the ETX Spotting Scope, as is discussed below, can be also used for casual astronomical observing. Similarly, the ETX Astro Telescope, by definition an astronomical telescope, is often used as a terrestrial instrument, as discussed in previous pages of this manual. Astronomical telescopes, including the ETX Astro Telescope, page 4, normally include mounting systems and/or motor drives specifically designed for astronomical object-tracking. Thus the differences between a spotting scope and an astronomical telescope generally lie not in the optical design but in the mechanical design that makes it particularly suitable for its primary intended application.

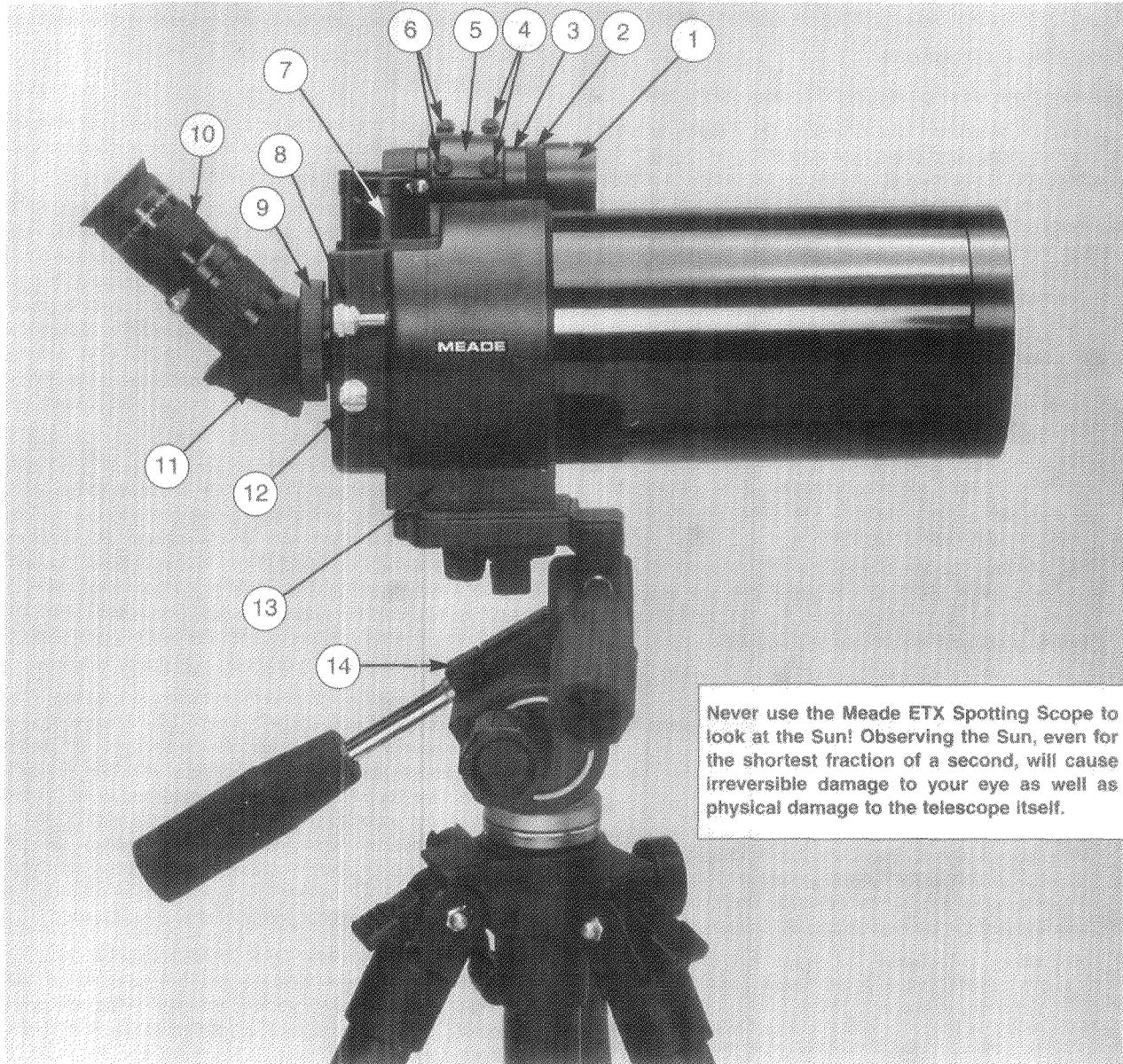


Fig. 19: The ETX Spotting Scope

- | | |
|---------------------------|--|
| 1. Viewfinder Lens Cell | 8. Focus Knob |
| 2. Knurled Ring | 9. Knurled Ring of #932 45° Erecting Prism |
| 3. Viewfinder | 10. SP 26mm Eyepiece |
| 4. Front Alignment Screws | 11. #932 45° Erecting Prism |
| 5. Viewfinder Bracket | 12. Flip-Mirror Control in "down" position |
| 6. Rear Alignment Screws | 13. Tripod Adapter Block (1/4-20 thread) |
| 7. 90° Eyepiece Holder | 14. Photo Tripod (user-supplied) |

GETTING STARTED

Parts Listing

When first opening the packing box of the ETX Spotting Scope, note carefully the following parts included with the telescope:

- The ETX Spotting Scope optical tube assembly.
- 8 x 21mm Viewfinder, packed in a separate, small box.
- Super Plössl (SP) 26mm eyepiece, packed in plastic storage container.
- #932 45° Erecting Prism
- Hex-wrench set with 2 (English-format) wrenches

The 8 x 21mm Viewfinder is packed separately from the main telescope in shipment to avoid the possibility of the viewfinder slipping in its bracket and scratching the viewfinder tube.

Assembly Instructions

Assembly of the telescope requires only three quick steps:

1. Slide the viewfinder into its bracket (5), Fig. 19, with the rubber-eyecup-end of the viewfinder fitting first through the front end of the bracket. It may be necessary to slightly unthread the six alignment screws (4) and (6), Fig. 19, to fit the viewfinder into the bracket. With the viewfinder inside the bracket, tighten (*to a firm feel only*) the six alignment screws down against the viewfinder tube. Alignment of the viewfinder will be discussed in a later section of this manual.
2. Remove the #932 45° Erecting Prism from its packing box. After unthreading the Photo Port cover (6), Fig. 1, thread the knurled ring (9), Fig. 19, of the #932 Prism on to the Photo Port. "Firm feel" tightening is sufficient.

Note: The rear-cell thread of the ETX telescope is called the "Photo Port," since this port is also used for attachment of a 35mm camera body to the telescope, as will be described further on in this manual.

3. Remove the SP 26mm eyepiece (10), Fig. 19, from its plastic storage container and place it in the eyepiece-holder of the #932 Prism (11), Fig. 19, tightening the eyepiece-holder's thumbscrew to a firm feel.

Assembly of the ETX Spotting Scope is now complete.

TELESCOPE USE

Quick Tips

1. **Viewfinder Alignment with Main Telescope:** When first attached to the telescope, the viewfinder and main optical tube are not aligned. Therefore, it is not possible to locate objects in the main telescope using the viewfinder. Procedures for aligning the viewfinder and main telescope are discussed in the next section of this manual.
2. **Flip-Mirror Orientation:** Confirm that the Flip-Mirror Control (12), Fig. 19, is in the "down" position so light is directed to the eyepiece.
3. **Focus Knob:** Sharp focusing of a telescopic image requires precise control of the focuser knob. Turn the focus knob slowly for clear viewing of objects.

Telescope Controls

Flip-Mirror Control: The ETX includes an internal optically flat mirror. The Flip-Mirror Control (12), Fig. 19, must be in the "down" position, as shown in Fig. 19, in order for light to reach the telescope's #932 Prism and eyepiece. Images seen through the #932 Prism will appear correctly oriented both up-and-down and left-for-right, just as they are normally seen without a telescope

Alternately, placing the Flip-Mirror Control in the "up" position (see Fig. 1, for example) diverts incoming light to a right-angle and permits observations with the eyepiece in the 90° eyepiece-holder (7), Fig. 19. If the eyepiece is moved to this position, re-focusing is required, and, while the image is correctly oriented up-and-down, it appears reversed left-for-right. The 90° observing position is particularly advantageous when observing objects high in the sky, such as aircraft, or astronomical objects, such as the Moon.

Focus Knob (8), Fig. 19: Turning this knob causes a finely-controlled internal motion of the telescope's primary mirror to achieve precise focus of the telescopic image. The ETX can be focused on objects from a distance of about 11.5 ft (3.5m) to infinity. Rotate the focus knob clockwise to focus on distant objects; rotate the focus knob counterclockwise to focus on near objects.

Magnification

The magnification, or power, at which a telescope is operating is determined by two factors: the *focal length of the telescope* and the *focal length of the eyepiece employed*.

Telescope Focal Length: Generally speaking, telescope focal length is the distance that light travels inside the telescope before reaching a focus. In the mirror-lens design of the ETX, however, this focal length is, in effect, compressed by the telescope's secondary mirror, so that a long effective telescope focal length is housed in the short ETX optical tube. The ETX's focal length is 1250mm, or about 49". If the ETX were a classical refracting-type of telescope, its optical tube would thus be more than four feet long instead of the ETX's compact 11" tube length.

Eyepiece Focal Length: The eyepiece focal length is the distance light travels inside the eyepiece before reaching focus. Focal length is usually printed on the side of the eyepiece. The Meade ETX is supplied with one eyepiece as standard equipment, a Super Plössl (SP) 26mm eyepiece. Thus, the focal length of the provided eyepiece is 26mm. "Super Plössl" refers to the optical design of the eyepiece, a design specifically intended for high-performance telescopes and one which yields a wide, comfortable field of view with extremely high image resolution.

Technical note to the advanced amateur astronomer: *The SP 26mm eyepiece supplied with Meade ETX telescopes is a special low-profile version of the standard Meade SP 26mm eyepiece and is about 1/4" (6mm) shorter than the standard eyepiece. This low-profile SP 26mm is designed to harmonize with the ultracompact scale of the ETX telescope and utilizes the exact same optics as the standard SP 26mm eyepiece. The SP 26mm low-profile eyepiece is not parfocal, however, with other eyepieces in the SP series; i.e., the eyepiece requires re-focusing when it is interchanged with other SP eyepieces.*

Calculating Magnification: On a given telescope, such as the ETX, different eyepiece focal lengths are used to achieve different magnifications, from low to high. The standard-equipment SP 26mm eyepiece, as stated above, yields 48X. Optional eyepieces (see pages 20 and 21) and the #126 2x Barlow Lens are available for powers from 31X to over 300X.

To calculate the magnification obtained with a given eyepiece, use this formula:

$$\text{Power} = \frac{\text{Telescope Focal Length}}{\text{Eyepiece Focal Length}}$$

Example: The power obtained with the ETX with the SP 26mm eyepiece is:

$$\text{Power} = \frac{1250\text{mm}}{26\text{mm}} = 48\text{X}$$

The most common mistake of the beginning observer is to "overpower" the telescope by using high magnifications which the telescope's aperture and typical atmospheric conditions can not reasonably support. Keep in mind that a smaller, but bright and well-resolved, image is far superior to a larger, but dim and poorly resolved, one. Powers above about 300X should be employed with the ETX only under the steadiest atmospheric conditions

Most observers will want to have 2 or 3 eyepieces to achieve the full range of reasonable magnifications possible with the ETX Spotting Scope. See page 18 for further details.

The ETX Spotting Scope utilizes the exact same astronomical-grade optical system as its sister instrument, the ETX Astro Telescope (page 4). As such, the ETX Spotting Scope may theoretically be used astronomically at powers up to about 300X, or slightly higher. Astronomical application of such high magnifications with the ETX Spotting Scope is impractical, however, because the telescope does not include the fork mounting system and automatic-tracking motor drive of the ETX Astro Telescope (page 10). Astronomical objects located at high power with the ETX Spotting Scope mounted on a photo tripod are also difficult to track, since the photo tripod is not designed for such an application.

At more moderate powers, however, such as between 31X and 63X, the ETX Spotting Scope can be used for observing the Moon and planets, as well as some objects in deep-space. Keep in mind that, notwithstanding the difficulty of tracking an astronomical object with the ETX Spotting Scope, the optical resolution of the image is identical to that of the ETX Astro Telescope, since both instruments use identical optical systems.

===== OBSERVING OBJECTS =====

The ETX Spotting Scope should be firmly attached to a suitable photo-tripod, using the 1/4-20 tripod adapter block (13), Fig. 19, located on the underside of the telescope's tube assembly.

Unthread the metal dust cap from the front lens. (This dust cap should be replaced after each observing session.) The ETX Spotting Scope may now be used for observations, but be sure to read at least the remainder of this section before attempting to use the telescope. Keep in mind that the viewfinder has not yet been aligned to the main telescope. As a result, the observer must sight along the side of the main tube to locate objects. With the standard-equipment SP 26mm eyepiece in place in the #932 45° Erecting Prism, as described above, the telescope yields 48-power, written "48X."

Important Note: *In the most discriminating applications, such as in observing delicate bird feather-structure at long distance, the ETX's internal, optically-flat mirror yields a higher-resolution image than is possible with any prism, including the #932 45° Erecting Prism. In these special cases ETX users are advised to observe with the eyepiece in the 90° eyepiece-holder (17), Fig. 19, with the Flip-Mirror Control in the "up" position. This admonition applies only to situations requiring extraordinarily high optical resolution and where the observer's eye is well-trained to observe very fine detail. In typical applications of the telescope terrestrially no image differences between the two eyepiece locations will generally be noted*

Never use the Meade ETX Spotting Scope to look at the Sun! Observing the Sun, even for the shortest fraction of a second, will cause irreversible damage to your eye as well as physical damage to the telescope itself.

The Viewfinder

The ETX Spotting Scope presents a fairly narrow field of view to the observer. As a result it is sometimes difficult to locate and

center objects in the telescope's field of view. The viewfinder, by contrast, is a low-power, wide-field sighting scope with crosshairs that enables the easy centering of objects in the main telescope's field. Standard equipment with the ETX Spotting Scope is a viewfinder of 8-power and 21mm aperture, called an "8 x 21mm viewfinder."

The ETX viewfinder, unlike most telescope viewfinders, presents a correctly oriented image, both up-and-down and left-for-right. This orientation particularly facilitates the location of terrestrial objects. The 8 x 21mm viewfinder is also a tremendous aid in locating faint astronomical objects before their observation in the main telescope.

Focusing the Viewfinder

The ETX viewfinder has been factory pre-focused to objects located at infinity. Individual eye variations, however, may require that the viewfinder be re-focused for your eye. Looking through the viewfinder, point the telescope at a distant object; if the viewfinder image is not sufficiently in focus for your eye, it may be re-focused as follows:

1. Remove the viewfinder from its mounting bracket (5), Fig. 19.
2. Loosen the knurled ring (2), Fig. 19, located near the viewfinder's objective (front) lens cell (1), Fig. 19. Unthread this ring (counterclockwise, as seen from the eyepiece-end of the viewfinder) by several full turns.
3. Focus of the viewfinder is accomplished by rotating the objective lens cell (1), Fig. 19, in one direction or the other, until distant objects viewed through the viewfinder appear sharp. One or two rotations of the viewfinder lens have a significant effect on image focus.
4. Once correct focus is reached, lock the focus in place by threading the knurled ring (2), Fig. 19, snugly up against the viewfinder's lens cell.
5. Replace the viewfinder into its bracket on the main telescope.

Alignment of the Viewfinder

In order for the viewfinder to be useful, it must first be aligned with the main telescope, so that both the viewfinder and the main telescope are pointing at precisely the same place. To align the viewfinder follow this procedure:

1. The viewfinder bracket (5), Fig. 19, includes six alignment screws. Turn *the 3 rear-most alignment screws* (6) so that the viewfinder tube is roughly centered within the viewfinder bracket, as viewed from the eyepiece-end of the telescope.
2. Using the SP 26mm eyepiece, point the main telescope at some easy-to-find, well-defined land object, such as the top of a telephone pole. Center the object precisely in the main telescope's field and lock the photo tripod so that the object can not move in the telescopic field.
3. While looking through the viewfinder, turn one or more of *the 3 front-most viewfinder alignment screws* (4) until the crosshairs of the viewfinder point at precisely the same position as the main telescope.

Re-check that the viewfinder's crosshairs and the main telescope are now pointing at precisely the same object. The viewfinder is now aligned to the main telescope. Unless the alignment screws are disturbed, the viewfinder will remain aligned indefinitely.

Using the Viewfinder

Now, to locate any object, terrestrial or astronomical, first center the object on the crosshairs of the viewfinder; the object will then also be centered in the field of the main telescope.

Note: If you intend to use higher observing magnifications, first locate, center, and focus the object using a low-power eyepiece (e.g., the SP 26mm eyepiece). Objects are easier to locate and center at low powers; higher power eyepieces may then be employed simply by changing eyepieces.

Terrestrial Observing

Viewing terrestrial objects require observers to look along the earth's surface through heat waves. These heat waves often cause degradation of image quality. Low power eyepieces, like the SP 26mm eyepiece provided with the ETX Astro Telescope, magnify these heat waves less than higher powered eyepieces. Therefore, low power eyepieces provide a steadier, higher quality image. If the land image is fuzzy or ill-defined, drop down to a lower power, where the earth's heat waves will not have such a deleterious effect on image quality. Observing in early morning hours, before the earth has built up internal heat, is generally more advantageous than during late-afternoon hours.

Photography through the ETX Spotting Scope

Photography through the ETX Spotting Scope requires the addition of the optional #64 T-Adapter, Fig. 20. With the #64 T-Adapter attached to the telescope, through-the-telescope photography is possible with any 35mm camera body with removable lens. In this way the telescope effectively becomes the lens of the camera.

For through-the-telescope photography, turn the Flip-Mirror Control (1), Fig. 20, to the "down" position, allowing light to pass straight-through the telescope and out the Photo Port. With the Flip-Mirror Control in the "down" position and the Photo Port's dust cover removed, the front lens of the telescope can be seen when looking through the Photo Port. The #64 T-Adapter threads on to the Photo Port, followed by a T-Mount for the particular brand of 35mm camera being used, followed in turn by the camera body itself (with camera lens removed).

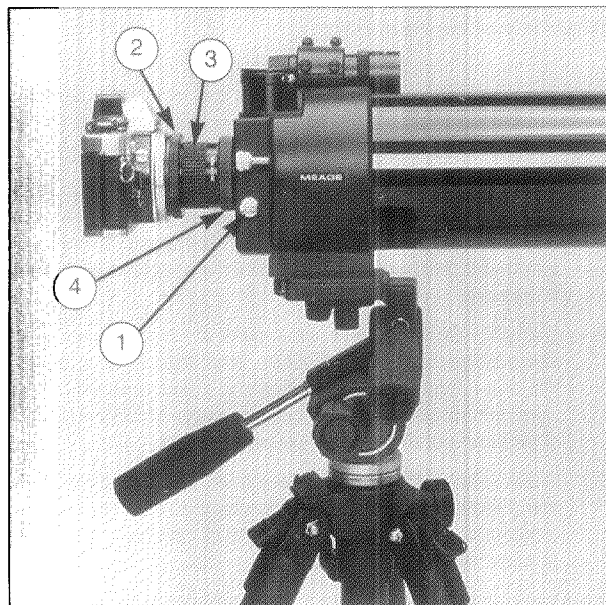


Fig. 20: Using the #64 T-Adapter with the ETX Spotting Scope. (1) Flip-Mirror Control in "down" position; (2) T-Mount; (3) Short section of #64 T-Adapter; (4) Knurled ring.

Note that the #64 T-Adapter consists of two sections which are threaded together in shipment. Either of the following photographic formats may be employed for coupling of the camera body to the telescope's Photo Port thread:

Camera Body + T-Mount + short section of the #64 T-Adapter;

or

Camera Body + T-Mount + both sections of the #64 T-Adapter.

The first format, using the short section only, of the #64 T-Adapter, is shown in Fig. 20. This format permits close-coupling of a camera body to the telescope at an effective photographic speed of f/14 and a transmission value (the so-called "T"-value) of 18. In this format vignetting will occur: the photographic image will appear on film as a circle, without illuminating the complete 35mm frame.

In the second format, with both sections of the #64 T-Adapter threaded together to form a rigid unit (see Fig. 11), the telescope is operating at a photographic speed of f/16 and T-value of 23, but without any field vignetting: images are illuminated to the edges of a standard 35mm frame.

To frame a subject in the viewfinder of the 35mm camera body, loosen slightly the knurled ring (4), Fig. 20, which threads the #64 T-Adapter to the telescope's Photo Port; rotate the camera body to achieve proper framing of the subject; then re-tighten the knurled ring.

Photography through a long lens such as the ETX requires special technique for good results, and the photographer should probably expect to waste a roll or two of film in acquiring this technique. Long-lens photography has its own rewards, however; rewards that short-focus lenses can not duplicate.

A few tips on photography through the ETX:

1. Use a rigid, heavy-duty photo tripod as a platform for the telescope. At effective focal lengths of 1250mm to 1450mm, even small external vibrations can easily ruin an otherwise good photo.
2. Use a cable-operated shutter release. Touching the camera body to initiate shutter operation will almost certainly introduce undesirable vibrations.
3. Focus the image with extreme care. While observing the subject through the camera's reflex viewfinder, turn the ETX's focuser knob to achieve the sharpest possible focus.
4. Correct shutter speeds vary widely, depending on lighting conditions and the film used. Trial-and-error is the best way to determine the proper shutter speed in any given application.
5. Terrestrial photography through the ETX is sensitive to heat waves rising from the earth's surface. Long distance photography is best accomplished in the early morning hours, before the earth has had time to build up heat.

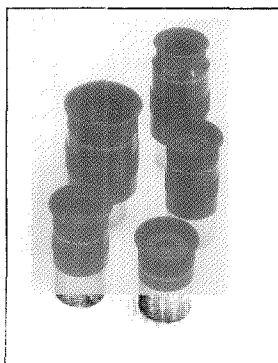
Astronomical photography is not practical through the ETX Spotting Scope, since the telescope is not mounted on a motor driven astronomical (equatorial) mount. Photos of the Moon or planets taken with the ETX Spotting Scope mounted on a photo tripod will appear blurred due to the earth's rotation during the period of the exposure.

OPTIONAL ACCESSORIES

A wide assortment of professional Meade accessories is available for the ETX Spotting Scope. The premium quality of these accessories is well-suited to the quality of the instrument itself.

Eyepieces

Professional-quality Meade Super Plössl (SP) and Super Wide Angle (SWA) Eyepieces in the standard American-size (1.25") barrel diameter (Fig. 21) permit a wide range of magnifying powers with the telescope. Powers obtained with each eyepiece are as follows:



Eyepiece	Magnifying Power
SP 6.4mm	195X*
SP 9.7mm	129X
SP 12.4mm	101X
SP 15mm	83X
SP 20mm	63X
SP 26mm**	48X
SP 32mm	39X
SP 40mm	31X
SWA 13.8mm	91X
SWA 18mm	69X
SWA 24.5mm	51X

* For astronomical applications only.
 ** Included as standard equipment with the ETX Spotting Scope.

Fig. 21: Optional eyepieces yield higher and lower magnifying powers.

Meade Super Plössl and Super Wide Angle Eyepieces are ideal for general-purpose terrestrial observing. The typical ETX user may wish to add 2 or 3 of these eyepieces to his or her telescope. An introductory selection might include the SP 9.7mm and SP 15mm. The more advanced observer will perhaps select the SP 9.7mm, SP 12.4mm, and SWA 18mm. Meade Super Wide Angle Eyepieces present fields of view almost 30% wider, power for power, than their Super Plössl counterparts.

#64 T-Adapter

The basic means of photography through the ETX Spotting Scope, the #64 T-Adapter (see Fig. 20) threads to the rear cell of the telescope, followed by a T-mount appropriate to your brand of 35mm camera (available through your local Meade dealer, or camera store). In this way the camera body is rigidly coupled to the telescope's optical system, which in effect becomes the camera's lens.

The ETX Spotting Scope Carry Bag

Perfectly suited to field use of, or traveling with, the telescope, the soft-padded, Cordura-type ETX Spotting Scope Carry Bag, Fig. 22, includes a shoulder strap and permits ready transport of the complete spotting scope tube assembly, including eyepiece, #932 Prism, and other optional accessories.

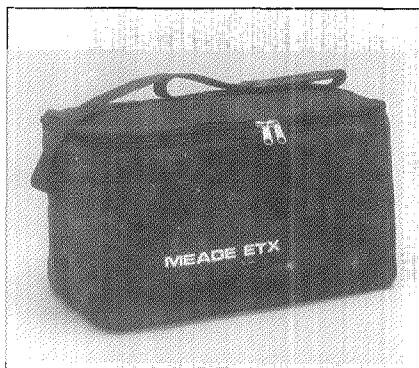


Fig. 22: The ETX Spotting Scope Carry Bag.

TELESCOPE MAINTENANCE AND SERVICING

General Maintenance

The ETX Telescope is a precision optical instrument designed to yield a lifetime of rewarding applications. Given the care and respect due any precision instrument, the ETX will rarely, if ever, require factory servicing or maintenance. Maintenance guidelines include:

1. Avoid cleaning the telescope's optics: a little dust on the front surface of the telescope's correcting lens causes virtually no degradation of image quality and should not be considered reason to clean the lens.
2. When absolutely necessary, dust on the front lens should be removed with very gentle strokes of a camel's hair brush or blown off with an ear syringe (available at any pharmacy).
3. Organic materials (e.g., fingerprints) on the front lens may be removed with a photographic lens cleaner solution, using soft, white facial tissues. Make short, gentle strokes and change tissues often.
4. In the very rare situation where cleaning the inside surface of the corrector lens becomes necessary, unthread the lens cell located at the front of the main tube. The entire correcting lens and secondary mirror system is mounted in this cell. Photographic lens cleaner solution, as above, may be used to clean the inside surface of the lens. **But do not touch the aluminized circular surface of the secondary mirror with your finger, a tissue, or any other object.** Scratching of the mirror surface will otherwise almost certainly result.
5. If the ETX is used outdoors on a humid night, water condensation on the telescope surfaces will probably result. While such condensation does not normally cause any damage to the telescope, it is recommended that the entire telescope be wiped down with a dry cloth before the telescope is packed away. Do not, however, wipe any of the optical surfaces. Rather, simply allow the telescope to sit for some time in the warm indoor air, so that the wet optical surfaces can dry unattended.
6. The super-gloss anodized finish of the ETX's deep-violet optical tube will fade if left in direct sunlight for prolonged periods.
7. Do not leave the ETX telescope inside a sealed car on a warm summer day; excessive ambient temperatures can damage the telescope's internal lubrication and electronic circuitry.
8. Two (English-format) hex wrenches is provided with each ETX Spotting Scope. These wrenches are used as follows:

Small wrench (.050"): Use the small wrench to tighten the set-screws of any knobs which may loosen; e.g., Focuser knob, or Flip-Mirror Control knobs.

Medium wrench (1/16"): This wrench is used to detach the viewfinder bracket from the telescope's rear-cell.

Proper Storage and Transport of the Telescope

When not in use, store the telescope in a cool, dry place. Do not expose the instrument to excessive heat or moisture. It is best to store the telescope in its original box. If shipping the telescope, use the original box and packing material to protect the telescope during shipment.

When transporting the telescope, take care not to bump or drop the instrument; this type of abuse can damage the optical tube and/or the front correcting lens.

Inspecting the Optics: A Note about the "Flashlight" Test

If a flashlight or other high-intensity light source is pointed down the main telescope tube, the view (depending upon the observer's line of sight and the angle of the light) may reveal what appears to be scratches, dark or bright spots, or just generally uneven coatings, giving the appearance of poor quality optics. These effects are only seen when a high intensity light is transmitted through lenses or reflected off the mirrors, and can be seen on any high quality optical system, including giant research telescopes.

The optical quality of a telescope cannot be judged by the "flashlight" test; the true test of optical quality can only be conducted through careful star testing.

Troubleshooting

The following suggestions may be helpful if you are having difficulty observing through the ETX Spotting Scope:

1. Confirm that all the lens or mirror covers have been removed from the telescope.
2. Confirm that the Flip-Mirror Control (12), Fig. 19, is in the "down" position so light is directed to the eyepiece (10), Fig. 19.
3. When objects appear in the viewfinder but not in the telescope, the viewfinder is not properly aligned with the telescope. Before the ETX is used the first time, the viewfinder must be aligned to the main telescope, as described on page 19. Once aligned, locate objects in the viewfinder first, then move to the main telescope.
4. Air conditions inside a warm house or building may distort terrestrial or celestial images and make it difficult, if not impossible, to obtain a sharp focus. For optimal viewing, use the telescope outside in the open air instead of observing through an open or closed window or screen.
5. For clear viewing of objects, turn the focus knob slowly since the "in-focus" point of a telescope is precise.
6. The optics within your telescope need time to adjust to the outside temperature to provide the sharpest images. To "cool down" the optics, set your telescope outside for 10 to 15 minutes before you begin observing.

Meade Customer Service

If you have a question concerning your ETX telescope, call Meade Instruments Customer Service Department at 714-451-1450, or fax at 714-451-1460. Customer Service hours are 8:30AM - 4:00PM, Pacific Time, Monday through Friday. In the unlikely event that your ETX requires factory servicing or repairs, **write or call the Meade Customer Service Department first, before returning the telescope to the factory**, giving full particulars as to the nature of the problem, as well as your name, address, and daytime telephone number. The great majority of servicing issues can be resolved by telephone, avoiding return of the telescope to the factory.

Specifications: ETX Spotting Scope

Optical design	Maksutov-Cassegrain
Clear aperture	90mm (3.5")
Focal ratio (photographic speed)	f/13.8
Near focus	11.5 ft (3.5m)
Resolving power	1.3 arc secs
Super Multi-Coatings	standard
Limiting visual stellar magnitude	11.7
Maximum practical visual power	325X
Optical tube dimensions	4.1" dia. x 11" long (10.4cm x 27.9cm)
Secondary mirror obstruction	1.1" (27.9mm); 9.6%
Materials:	
Tube body	aluminum
Rear cell	high-impact ABS
Primary mirror	Pyrex® glass
Correcting lens	BK7 optical glass, Grade-A
Telescope dimensions	4.1" dia. x 11" long (10.4cm dia. x 27.9cm)
Telescope net weight	3.1 lbs. (1.4 kg)
Telescope shipping weight	6.5 lbs. (3.0 kg)



MEADE LIMITED WARRANTY

Every Meade telescope, spotting scope, and telescope accessory is warranted by Meade Instruments Corporation ("Meade") to be free of defects in materials and workmanship for a period of ONE YEAR from the date of original purchase in the U.S.A. and Canada. Meade will repair or replace a product, or part thereof, found by Meade to be defective, provided the defective part is returned to Meade, freight-prepaid, with proof of purchase. This warranty applies to the original purchaser only and is non-transferable. Meade products purchased outside North America are not included in this warranty, but are covered under separate warranties issued by Meade international distributors.

RGA Number Required: Prior to the return of any product or part, a Return Goods Authorization (RGA) number **must** be obtained from Meade by writing, or by calling (714) 451-1450. Each returned part or product must include a written statement detailing the nature of the claimed defect, as well as the owner's name, address, and phone number.

This warranty is not valid in cases where the product has been abused or mishandled, where unauthorized repairs have been attempted or performed, or where depreciation of the product is due to normal wear-and-tear. Meade specifically disclaims special, indirect, or consequential damages or lost profit which may result from a breach of this warranty. Any implied warranties which can not be disclaimed are hereby limited to a term of one year from the date of original retail purchase.

This warranty gives you specific rights. You may have other rights which vary from state to state.

Meade reserves the right to change product specifications or to discontinue products without notice.

This warranty supersedes all previous Meade product warranties.





Meade Instruments Corporation

World's leading manufacturer of astronomical telescopes for the serious amateur.

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